This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

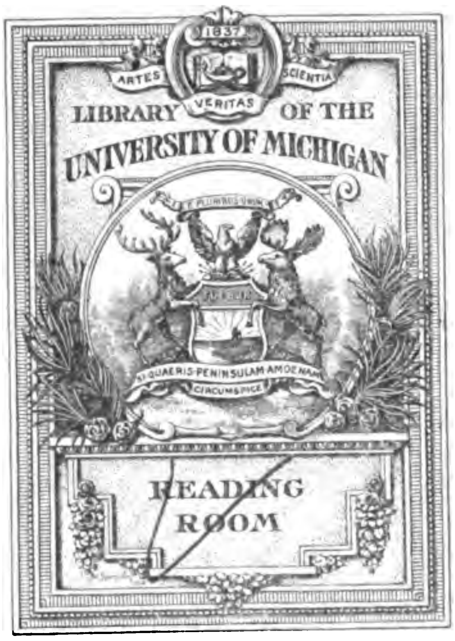
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

B 435753



1837
ARTES VERITAS SCIENTIA
LIBRARY OF THE
UNIVERSITY OF MICHIGAN
E PLURIBUS UNUM
TUEBOR
SI QUAERIS PENINSULAM AMOENAM CIRCUMSPICE
~~READING ROOM~~

SB
45
.B16
1900
copy 2

CYCLOPEDIA OF AMERICAN HORTICULTURE

·The M Co·

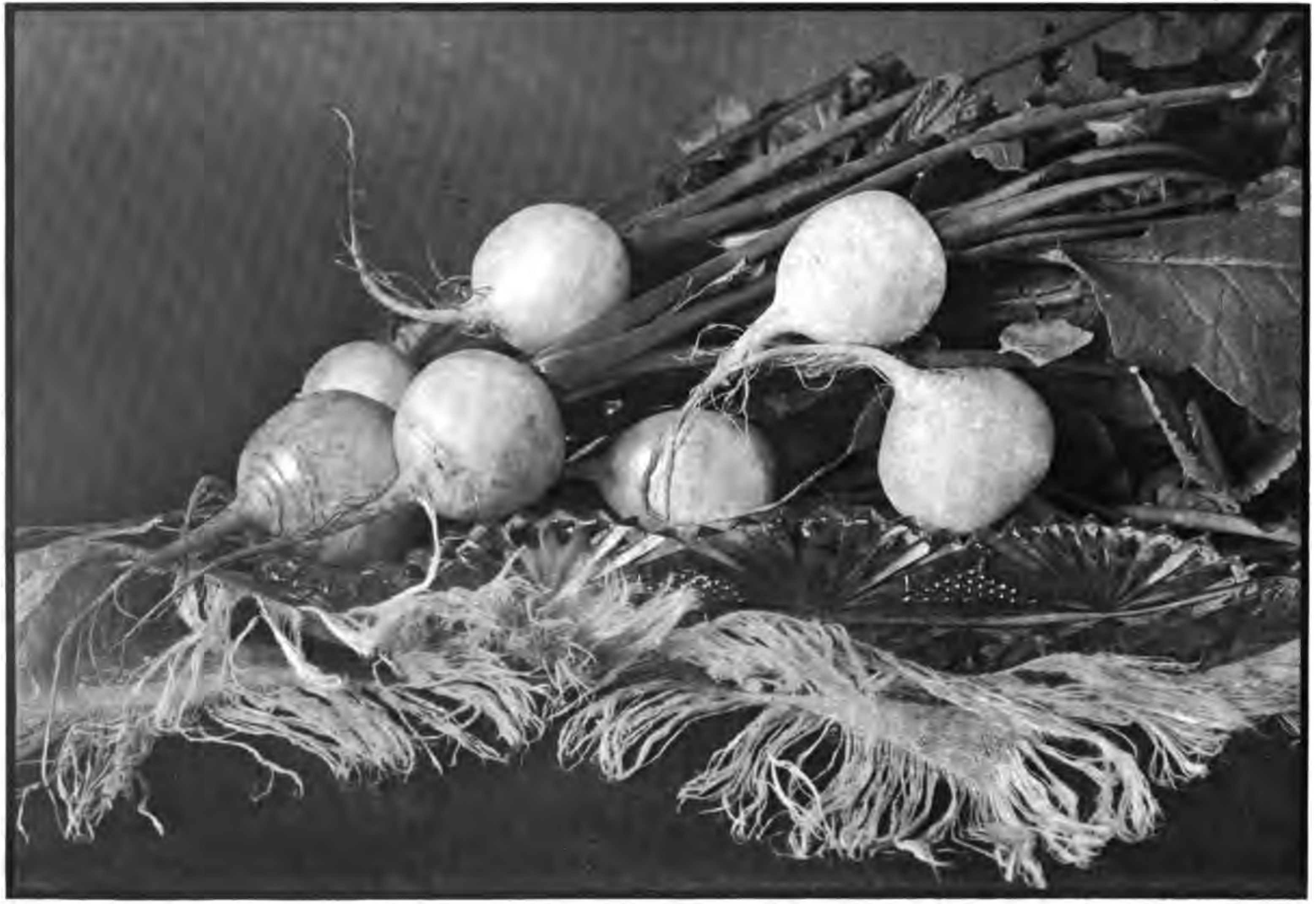


Plate XXXI. Radish, Philadelphia White Box.

CYCLOPEDIA OF AMERICAN HORTICULTURE

COMPRISING SUGGESTIONS FOR CULTIVATION OF HORTICULTURAL PLANTS, DESCRIPTIONS OF THE SPECIES OF FRUITS, VEGETABLES, FLOWERS AND ORNAMENTAL PLANTS SOLD IN THE UNITED STATES AND CANADA, TOGETHER WITH GEOGRAPHICAL AND BIOGRAPHICAL SKETCHES

BY
L. H. BAILEY
Professor of Horticulture in Cornell University

ASSISTED BY
WILHELM MILLER, PH.D.
Associate Editor
AND MANY EXPERT CULTIVATORS AND BOTANISTS

Illustrated with over
Two Thousand Original Engravings

IN FOUR VOLUMES
R-Z

New York
THE MACMILLAN COMPANY
LONDON: MACMILLAN & CO., LTD.
1902

The rights of reproduction and of translation are strictly reserved

COPYRIGHT, 1902
BY THE MACMILLAN COMPANY

Mount Pleasant Press
J. HORACE McFARLAND COMPANY
HARRISBURG • PENNSYLVANIA

NOW THAT THE CYCLOPEDIA OF AMERICAN HORTICULTURE is completed, it is due the reader that some information be given him of the methods by which it has been made and of the resources that have been at command. It is due to the Editor that he be allowed to state his own point of view in respect to the meaning of the work. These remarks are made in no feeling of personal pride, for the writer is keenly aware of the many shortcomings of the book; but they may acquaint the reader with some of the difficulties with which such work is attended, and they may be suggestive to those who may desire to prosecute similar studies.

RETROSPECT

I. THE PROJECT

The most difficult part of the making of a cyclopedia is to project it. Its scope and point of view must be determined before a stroke of actual work is done. This much done, the remainder is labor rather than difficulty. The lay-out of the enterprise cannot be made in a day. It is a matter of slow growth. One must have a mental picture of the entire field and must calculate the resources. The plan once perfected, it remains only to work out detail after detail, taking up the tasks as they come, not caring nor even daring to look forward to the work that piles mountain high farther down the alphabet.

So far as the Cyclopedia of American Horticulture is concerned, the Editor had resolved and reviewed the enterprise for more than ten years. The first suggestion was a vague idea that a comprehensive work was needed. There were several hundred special works on American horticulture. Some subjects were well worked; others were untouched. There was no means of determining the extent of our wealth in cultivated plants. There were no suggestions, even, as to what that wealth might be. No survey had been made. Only a full inventory can tell us whether we are rich or poor; it gives us a scale by which to measure progress.

The first tangible result of this desire for some comprehensive view of American horticulture was the publication of "Annals of Horticulture for 1889." Some years before this time an endeavor had been made to interest a publisher in the project, but without success. This annual volume was designed to be "a witness of passing events and a record of progress." Five years these annual volumes were issued, the last one containing a summary sketch of horticulture at the World's Fair, at which was made the greatest single effort to display our horticultural achievements and possibilities. In these annual volumes all the new plants and tools and movements of the year were intended to be recorded. Special investigations were made for some of the volumes. The issue for 1889 contained a list of all the kitchen-garden vegetables sold in North America in that year; that for 1891 contained a census of all the native plants which had been introduced into cultivation, showing that 2,416 species had become known to the horticulturist in Europe or America, although many of these probably were not then in cultivation; that for 1892 made an annotated inventory of the varieties of apples that had been and were in cultivation in North America, showing that 878 varieties were actually offered for sale by American nurserymen in that year. But these volumes were isolated; they picked up the work piece by piece. An inventory of the whole field, critically and laboriously made, was needed before mere annals of yearly progress could signify much. We needed to know our status; thereafter chronicles would have a meaning.

From 1893, attention was given to the larger and comprehensive effort. A garden herbarium had to be made, for there was none in the country. The first plant had been put into this herbarium in 1889 ; it was a mere sprig of the greenhouse shrub *Boronia megastigma.* There are difficulties in making a garden herbarium : there are no professional collectors and one cannot buy specimens ; many cultivated plants are too valuable to allow of specimens to be made. This herbarium now has more than 12,000 mounted specimens. Although small, nevertheless it has been invaluable. If it does not show nearly all the species, it shows the range of variation in some, and thereby suggests what may take place in all. It also shows what is actually cultivated under a given name, whether that name be correct or not.

Trial excursions were made into the evolution of various perplexed garden plants. Some of these essays have been published. Out of these efforts grew the volume, "Sketch of the Evolution of Our Native Fruits." The study of garden plants is a different subject from the study of wild plants. Mere descriptions are often of little value. The plant may have been bred away from the description within a decade. Specific descriptions of many of the common garden plants do not exist in books : the plants are not species in the book sense.

American horticultural books must be collected, for the comprehensive work, if it came, must contain American advice. One must know the range of New World experience and the occidental point of view. It has been the misfortune of many American writings that they have drawn too heavily from the experience of the Old World. Once this was necessary, but now it is time to break away. Fifty authors have written on viticulture in America, yet scarcely one has caught the spirit of the American grape-growing. Nearly twenty years of collecting by the Editor has brought together the completest library of American horticultural books.

The details entering into any comprehensive cyclopedia of horticulture are astonishing in number and variety. Consider some of the items: More than 10,000 species of plants in cultivation; almost every important species phenomenally variable, sometimes running into thousands of forms; every species requiring its own soil and treatment, and sometimes even minor varieties differing in these requirements; limitless differences in soils and climates in our great domain, every difference modifying the plants or their requirements; a different ideal in plant-growing and plant-breeding in the mind of every good plant-grower; as many different kinds of experience as there are men; many of these men not facile with the pen, although full of wholesome fact and experience; the species described in books which deal with the four corners of the earth; very few botanists who have given much attention to the domestic flora.

It was desired that the Cyclopedia be new—brand-new from start to finish. The illustrations were to be newly made ; the cultural suggestions written directly for the occasion from American experience, and often presented from more than one point of view ; few of the precedents of former cyclopedias to be followed ; all matters to be worked up by experts and from sources as nearly as possible original. Of course it has been impossible to reach the ideals. There are limitations of expense and time as well as of capability: for it is yet a question whether our new country is ready for such a laborious work.

In America there has been but one cyclopedic work on horticulture, Henderson's "Handbook of Plants," 1881; second edition, 1890. This is in one volume. The most complete similar recent work in the English language is Nicholson's "Illustrated Dictionary of Gardening," four volumes, 1884–87. It is the work of the talented ex-Curator of the Royal Botanic Gardens at Kew, England. Mottet's French edition of Nicholson, five volumes, 1892–99, is the largest modern cyclopedia of horticulture, and the only one which excels in size the present American venture. Another popular English work in one volume is Wright & Dewar's revision of "Johnson's Gardener's Dictionary," 1894. Another recent French work, also in one volume, is Bois' "Dictionnaire d' Horticulture," 1893–99, with colored pictures printed in the text. In German is Rümpler's "Illustriertes Gartenbau-Lexikon," in one volume, with a recent new edition; also Siebert & Voss' "Vilmorin's Blumengärtnere," one volume of text and one of plates, 1896, the most critical of all similar works. In judging the American work, the reader must bear in mind that there is really no critical horticultural-botanical writing in this country back of the present decade. The present Cyclopedia reflects the imperfection of our literature as well as the shortcomings of the Editor.

II. THE OFFICE DETAILS

Before the actual writing was begun, other cyclopedias were searched for suggestions of subjects to be inserted. Also, a card index was made to portraits of plants in the leading horticultural and botanical serials, to descriptions of plants in current publications, to monographs, and to the names of leading horticultural varieties in some of the larger groups. This card index grew during the progress of the work, and it now comprises about 35,000 cards.

The "trade lists" were also made. These lists were intended to afford a record of the plants actually in cultivation in North America north of Mexico. Catalogues of more than one hundred leading seedsmen, florists, and nurserymen were cut up, and all the information respecting the various genera pasted on yellow sheets of standard letter-paper size. Thus, on one sheet, or one set of sheets, would be all the entries on Abies, Bocconia, Saxifraga, and the like. On these "trade lists" were made notes respecting persons who are skilled in the culture of the particular plants, together with extracts from letters, items of experience, and other incidental information. The name of the catalogue from which the cuttings were made was preserved, in order that doubtful questions might be traced. In special groups, it has been impossible to determine just what species are in cultivation because they are not all recorded in printed catalogues and they are known chiefly to a few fanciers or collectors. This limitation is particularly apparent in orchids; also in such large special genera as Acacia and Eucalyptus. In such cases it is practically impossible to make complete lists, and it is probably scarcely worth while to make the effort; but all the species that are generally known are almost sure to have been recorded. Since the Cyclopedia is designed as a permanent work of reference, mere horticultural varieties have been omitted, as a rule; but an effort has been made to indicate the dominant types or races, the evolution of garden favorites, the good and bad "points" of important variations, and to suggest possible lines of progress.

These trade lists were "standardized" in order to determine the proper nomenclature for the various entries; for Virgilia had to be brought forward to Cladrastis and Amianthium placed with Zygadenus. This preliminary work had to be done with care. It necessitated, also, the adoption of some one work as a standard; and the only work which covered the field and answered other requirements is Index Kewensis. This work has been followed in the main, although every contributor has been free to express his own ideas of genera and species, and the recent monographs have been followed for special groups.

The work for a whole letter—as the letter A—was laid out in advance. The general theory was to assign every article to an authoritative writer. Articles that could not be assigned, or for which no person would hold himself responsible, fell to the editors. It therefore happened that many of the most critical puzzles fell to the office. On very important subjects, two to six persons were asked to contribute. If these persons wrote from experience, no effort was made to cause their statements to be uniform, although it was desired that they should harmonize whenever possible. It was desired that the work have personality, for this is vitality. In horticultural matters there is no final opinion.

The articles have been written by busy men. Serious delays have resulted in securing the manuscripts; and yet the Editor must express his gratification with the general promptness of the contributors. With scarcely an exception, the collaborators have seemed to feel a personal responsibility in the success of the undertaking. The manuscripts have been much edited, yet they have not been copied. Not a single parcel is known to have been lost in the express or mails. The Cyclopedia has had a patient printer. On all kinds and sizes of paper, and in every style of script, with cabalistic editorial marks in pencil and in inks of various colors, these manuscripts have gone to the compositor. Returning from the printer, they have been sorted and filed, and finally tied in bundles, in which condition they now constitute a part of the archives of the Cyclopedia.

Usually the printer received copy for one letter at a time. In large letters, as C, P, S, one section—as Ca, Po, St—comprised one sending, for it has been impossible to keep far ahead of the compositors. When all the manuscript was received from the various writers, cyclopedic works were consulted to see that no entries were omitted. The titles of all entries were copied when the manuscripts went to the printer, and the entries were checked off when they appeared in galleys and pages. Failure to check up entries in the letter A resulted in the loss of the article "Aubrietia," and the plate had to be recast in order to insert it.

The type-matter was first seen in "galleys" on green paper, with the cuts separate, known in the office as "the long green." Six proofs were received by the Editor, who sent four or five of them to specialists on the various subjects. Every line in the work has been read in the proof by experts. It requires from a week to ten days to get back the proofs from the various readers. The matter is then made up into pages, and read again. It is then cast, and the final proofs are placed on file. The galley proofs are gone over several times by the Editor, aside from the regular reading, each time for a specific purpose: once for alphabetic order of the entries; once for spelling of names; once for accent marks; once for signatures to the articles; once for references to the cuts; once for legends to the cuts; once for general style. A full page of the Cyclopedia contains 14,000 pieces of metal. The reader will be lenient when he finds a misplaced letter. A clerk was employed to verify all references by hunting up the references themselves.

In the "make-up" it is an inviolable rule that wherever the book opens, an engraving will be seen. Adherence to this rule has made trouble in some cases. In one instance it was necessary to have a new cut made after the forms were made up, and to renumber the legends of more than one hundred pictures. The mechanical make-up was in the hands of I. B. Kraybill, foreman of the composing-room of the Mt. Pleasant Press, who gave the work loving and thoughtful care until, in the letter T, he was called to lay down his labors. The Editor hopes that the reader will regard his memory whenever the arrangement of the pictures is a source of satisfaction and pleasure.

The Cyclopedia has been edited in a room eighteen feet square, kindly allowed for this use by Cornell University. In this room were two long tables, which allowed of the disposition of manuscripts and pictures in delightful abandon; the garden herbarium of Cornell University; and a large collection of books, mostly loaned from the Library of Cornell University. Aside from monographs, botanical manuals, local floras, horticultural handbooks, dictionaries, the following works were on the shelves: Index Kewensis (intended to contain all species of flowering plants down to 1885—about 125,000 names); Bentham and Hooker's Genera Plantarum; Engler and Prantl's Natürlichen Pflanzenfamilien; DeCandolle's Prodromus (17 volumes), and his Monographiæ Phanerogamarum (9 volumes thus far); the Kew List of new species introduced into cultivation between 1876 and 1896. Next in importance were the periodicals, containing perhaps 50,000 pictures of plants, many of them colored and mostly authentic. First rank must be accorded the peerless Curtis' Botanical Magazine, with its 125 volumes, containing over 7,600 colored plates. Edwards' Botanical Register, Loddiges' Botanical Cabinet, L'Illustration Horticole, Flore des Serres, Paxton's Magazine, Revue Horticole and The Garden are extensive works provided with colored plates, for details of which the reader may consult Vol. I, pp. xvii and xviii. Less extended periodicals containing colored plates have been used, as The Botanist by Maund, The Florist and Pomologist, Knowles & Westcott's Floral Cabinet, Meehan's Monthly and an incomplete set of Gartenflora and Revue d'Horticulture Belge. Of horticultural periodicals not containing colored plates, the Gardeners' Chronicle is a great store of botanical knowledge, being published since 1841. It is full of botanical monographs of garden genera, and is a rich repository of description of new species. A complete set of the Journal of Horticulture has been available and all the pictures in its third series have been indexed. Of American periodicals, Garden and Forest, American Gardening, American Florist, Florists' Exchange, Florists' Review and Gardening have been very helpful.

The three most useful bibliographical works on botany have been Pritzel's Thesaurus, Jackson's Guide to the Literature of Botany, and the Catalogue of the Kew Library. About two dozen cyclopedic works were thoroughly examined and kept at hand for various periods, as those of Nicholson, Mottet, Siebert and Voss; the Bois' Dictionnaire d'Horticulture, Johnson's Gardener's Dictionary, Paxton's Botanical Dictionary, Rümpler's Illustriertes Gartenbau-Lexikon, Loudon's Encyclopædia of Gardening, Lindley and Moore's Treasury of Botany and various editions of the prototype of all such undertakings,—Philip Miller's Gardener's Dictionary. The floras of foreign countries have been as indispensable as those of America. Flora Capensis (4 vols. thus far), Flora Australiensis (7 vols.) and the Flora of British India (7 vols.), have been used the most. On European plants, Koch's Synopsis Floræ Germanicæ et Helveticæ, Grenier & Gordon's Flore de France, Ledebour's Flora Rossica, and Bentham's Illustrated Handbook of the British Flora, and others, have been constantly at hand.

On Asiatic plants the following have been studied: Boissier's Flora Orientalis, Post's Flora of Syria, Palestine and Sinai, Siebold and Zuccarini's Flora Japonica, Franchet & Savatier's Enumeratio Plantarum Japonicarum, Maximowicz's Diagnoses Plantarum Asiaticarum and Diagnoses Plantarum Japonicæ, Bentham's Flora Hongkongensis, Forbes & Hemsley's Flora of China in vol. 23 of the Journal of the Linnean Soc., Blanco's sumptuous Flora de Filipinas, Baker's Flora of Mauritius and the Seychelles, and Hooker's Flora of British India.

The office force consisted of the Editor and Associate Editor, the latter giving all his time to the work for four years. For a time, Alfred Rehder was employed at the Arnold Arboretum, near Boston, to work on the hardy trees and shrubs. For two months F. W. Barclay, a former student at the Massachusetts Agricultural College and now gardener for C. A. Griscom, Haverford, Pennsylvania, joined the office at Ithaca, giving most of his attention to herbaceous plants. Heinrich Hasselbring, graduate of Cornell University and trained as a florist, joined the office force for a time, devoting his attention mostly to orchids. No other writers have been employed otherwise than as contributors. The Associate Editor has had particular charge of indexes, trade lists, bibliographical matters, and editing of manuscripts. Aside from constructive and administrative matters, the Editor has had special charge of illustrations, proof-reading, arrangements with contributors and the make-up of the galleys into pages. He has read every line of the work, much of it several times over. The Editor desires to express his appreciation of the aid which the Associate Editor, Wilhelm Miller, has rendered to him and to the Cyclopedia. With unbounded zeal, persistent industry and painstaking thoroughness, he has given his best effort to the work from start to finish.

The pictures have been made by a score and more of artists. With the exception of the fifty half-tone full-page plates, they are all line drawings. The greater part of these drawings have been made from the living plants or other objects. Many have been drawn from photographs, of which a large collection was made. Some have been composed from combined suggestions of authoritative prints. botanical specimens, and other information. Some of the pictures are from the American Garden, having been made for that journal in the years 1890 to 1893, under the supervision of the present Editor. These engravings passed into the hands of the J. Horace McFarland Company, and by this company have been used for the present publishers. A number of the cuts have been borrowed from the Cornell University Experiment Station. Some of the illustrations are those used in the books in which the Editor is interested and which are published by The Macmillan Company. The pictures are intended to represent the average excellence of the plants, and, therefore, they are not idealized. The artists who have made the largest number of illustrations directly for the Cyclopedia are: Charles W. Furlong and W. C. Baker, Instructors in Drawing in Cornell University; E. N. Fischer and C. H. L. Gebfert, Jamaica Plain, Mass., who had access to the Arnold Arboretum; Miss H. A. Wood, Kingston, Jamaica, West Indies, who has drawn tropical economic plants; G. R. Chamberlain, who has drawn many plants, particularly annuals, in the gardens of Cornell University; Miss R. M. Huntington, who had access to the gardens at Smith College, Northampton, Mass.; Mrs. K. C. Davis and Miss Marie L. Robertson (now Mrs. B. M. Duggar), then at Ithaca, N. Y. The artistic work has been aided at almost every point by the personal interest of J. Horace McFarland, proprietor of the Mt. Pleasant Press, Harrisburg, Pa., where the type-setting and presswork have been done. Himself an expert photographer, Mr. McFarland has given freely of photographs and advice; and he has also overseen the mechanical construction of the Cyclopedia with rare devotion and skill.

III. HOW A GENUS IS WRITTEN UP

The method of writing up a genus differs with the various writers. The Editor can speak only for himself, but the frequency with which persons ask for a specific method of procedure suggests that a brief narrative may be useful to students.

The first question that arises when a new genus is to be written up is the number of species to be accounted for. The "trade list" and the card index are consulted, and a list is made of all the species that are to be included in the account. The writer first standardizes the names with Index Kewensis as a working basis, and then consults some analytic account of the genus itself, as Bentham and Hooker's Genera Plantarum, and Engler and Prantl's Natürlichen Pflanzenfamilien. Herbarium specimens are examined. A characterization is made of the genus. All available works are consulted for suggestions as to its horticultural and economic importance.

Then follows the really important part of the undertaking—the accounting for all the species. All monographs of the genus are consulted; herbarium specimens are studied in detail; horticultural cyclopedias and handbooks are searched for descriptive notes of the species. Every effort is made to understand the species as a whole before any one species is actually described, for in this cyclopedia the species are compared and contrasted, not arranged alphabetically. A key to all the species must be outlined before the work of description can be undertaken. This means that every species must be studied and properly classified. This making of the key or classification comprises more than half the average work of writing up the various genera. Cultivated plants come from many parts of the world. In many cases no single account of the genus contains all the species. One or two species from outlying regions may not fit into any scheme of classification made in the books. The descriptions of them may be inadequate. Often a whole day will be spent in the endeavor to find characters that will allow these outlying species to be included in a common key. Moreover, botanical keys are often too minute and technical to be used in a horticultural work. The key-scheme once made, the description of the species is drawn from every available source;—from specimens and personal experience when possible; from authoritative monographs; from horticultural journals and treatises; from notes sent by correspondents; from the information contained in trade catalogues. On doubtful points correspondence is opened with persons who know the plants, particularly with those who advertise the given kinds. The fulness of the descriptions will depend on how difficult the plants are to distinguish and how important the group is to the cultivator. It has been the custom with the Editor to work mostly with bare outlines at first, afterwards filling in the matters of secondary and incidental importance from subsequent reading and investigation. It has been the custom of the Associate Editor to devour and digest all the incidentals, as well as the fundamentals, before beginning the writing.

In the editing of manuscripts, the first effort is to determine whether the author has accounted for all the names in the trade. Too often the troublesome names have been omitted, although he worked from lists sent from the Cyclopedia office. These omitted names must be inserted, often necessitating the entire reconstruction of the classificatory scheme. The second attention is given to the scheme itself, to see that it is properly coördinated or balanced; for a scheme is of no value unless the coördinate parts are contrasts of similar characters. Yet the failure to coördinate the keys was common, particularly in the earlier part of the work. For example, there is no service in the key that runs

A. Lvs. long-lanceolate, entire
AA. Fls. blue, in long racemes

and yet it has been constantly necessary to eliminate examples of this type. The third effort in the editing of manuscripts is the revision of nomenclature, for uniformity in this matter is of the utmost editorial importance. The fourth effort is to look up and insert all references to portraits of the plants. Beyond these efforts, the editing of the manuscripts had to do chiefly with matters of literary form.

To the looker-on, the actual writing of the articles may appear to be the larger part of the work. As a matter of fact, however, it has required more labor to secure articles from correspondents than it would have required to have written them ourselves. This is not because correspondents have been negligent, but because of the inherent difficulties of doing work at long range. The value of the material, however, is vastly improved and broadened because of the number of persons who have been engaged in preparing it. It is probable that two-thirds of the labor in preparing the Cyclopedia has been of a character that is not directly productive of written articles,—as correspondence, keeping of accounts, filing of material, securing illustrations, proofreading.

PROSPECT

The Editor hopes that this Cyclopedia will never be revised. If new issues are called for, mere errors should be corrected; but beyond this, the plates should be left as they are, for it is the purpose of the book to make a record of North American horticulture as it exists at the opening of the twentieth century. It is hoped that subsequent progress may be recorded in annual supplemental volumes. It is planned to issue each year a supplement of say 75 to 100 pages, in the same size of page as the present book, with cumulative index, in paper covers; every five years these supplements may be completed into a volume. They should record the introductions of new plants and methods, contain revisions of important genera, encourage historical studies, and make reviews of the tendencies of plant culture in North America. The manuscript for the first two proposed supplements is already prepared. The first is a complete key to all the families and genera in the Cyclopedia, designed to enable the student to run down any species that he may have in hand. It was hoped that this key could be printed as a supplement to Volume IV, but the size of the volume forbids it. The second manuscript is a bibliography of the North American book writings on horticulture. These supplements are not definitely promised, but they will be made if there is sufficient demand for them.

It may not be out of place for the Editor to indicate what he conceives to be the most important features of the general plan of the Cyclopedia.

(1) The book represents a living horticulture. It has attempted to account for the species that are actually in cultivation in the country, rather than those that chance to have been described or pictured in other cyclopedias or in periodical publications. The best way of determining what plants are actually in cultivation is to make a list of

those that are offered for sale within a space of ten or fifteen years, supplemented with lists submitted by actual cultivators. It is not the fact that these plants are bought and sold that is important, but the fact that they are in cultivation at the present time in this country. These lists give us a census of our horticultural resources. A species-name which occurs in trade lists must be run down and inserted. Not knowingly has any been omitted.

(2) The species are compared and contrasted, as well as described. In all genera containing several species, keys or classificatory schemes have been devised. This makes it incumbent upon the writer that he understand each species, not merely copy a description of it. It enables the reader to name the species he has in hand. It is an analytic rather than a compilatory method. The reader will be surprised to know how much labor the mere introduction of keys has added to the making of the book. It has certainly more than doubled the labor. The Editor believes that he could make the entire Cyclopedia in two years' time if all the species were to be arranged alphabetically under the genus and without introductory keys.

(3) The leading articles are signed with the name of the writer. Thereby is responsibility fixed and due credit given. The chief value of the signed article, however, is the fact that it gives personality to the writings and presents a wide range of experience and achievement. It is singularly gratifying that horticulturists and botanists have responded with the greatest good will to the repeated calls for help. Their inspiration has saved the book. The botany of large and difficult groups has been placed bodily in the hands of specialists. The number of contributors is large and has grown with each volume. More than 450 persons have aided in the making of the Cyclopedia. The great number of signed articles gives the work a somewhat heterogeneous character, and this may be considered by some persons to be a disadvantage; but the Editor has not accepted the current idea that a cyclopedia must necessarily be uniform and consistent in its treatment of various and unlike subjects.

(4) The book is primarily a cyclopedia of horticulture, rather than of gardening. It has endeavored to catch the large-area and commercial spirit of North American plant culture, while still holding to the many and varied amateur interests. Not all the entries are names of plants.

(5) It has attempted to represent plants as living and growing things that are still undergoing evolution. It has tried to indicate the range and extent of variation, rather than to treat plant-names as representing entities in nature. Whenever possible it has been the purpose to suggest the general lines of evolution in the important groups. This has introduced the historical method of treatment. Of course only the merest touch can be had with these subjects, because knowledge of them is yet to come; but it is hoped that the sympathetic reader will feel the drift of an evolutionary motive.

Other points of view that seem to the Editor to be important are: The effort to present a new set of horticultural pictures; to give biographies of persons who have had an important influence on the trend of American horticulture; to present geographical and historical subjects; to give special attention to tropical and subtropical economic plants; to cite freely references to literature.

It must be admitted that the foregoing categories are ideals. At all points, it is feared, the accomplishment has fallen far short of the purpose. The Editor would like to do the work all over again, so many are the improvements that might be made. One must make a book in order to learn how to make it. The work has grown as it has progressed. At first it was intended to make a three-volume cyclopedia, but before the first volume was half written it was found that a fourth volume must be added in order to present the subject adequately. The observant reader will discover that the letter A is treated on the three-volume basis. The article "Apple" is wholly inadequate, but partial penance is done under "Pomology." The article "Asparagus" is the first that began to feel the fuller and larger treatment. Whatever usefulness the Cyclopedia may have has been rendered possible by the liberal policy of the publishers with whom it has been a joy and an inspiration to work.

The actual writing on the Cyclopedia was begun in January, 1899. A year had then been spent in making indexes and collecting data. The proof of the letter Z was received December 31, 1901. On the 8th of January, 1902, the Cyclopedia office was vacated. It was a sad parting. The pleasantest associations of a pleasant life had come to a finish. We knew that it was a turning-point. Hundreds of books had become familiar friends. We would never see them all together again. Like a child, the Cyclopedia had grown. Like the mature youth, it had left us. It was no longer ours.

L. H. BAILEY.

ITHACA, NEW YORK,
January 11, 1902.

STATISTICS

I. THE NUMBER OF ARTICLES.

Total number of entries or articles, including cross-references:

Volume I.	1270
Volume II.	1263
Volume III.	659
Volume IV.	1165
	4357

II. THE NUMBER OF PLANTS.

The number of genera described:

Volume I.	820
Volume II.	623
Volume III.	351
Volume IV.	461
	2255

Total number of species fully described (in black-faced type):

Volume I.	2924
Volume II.	2675
Volume III.	1405
Volume IV.	1789
	8793

Total number of varieties (of species) of all grades:

Volume I.	1187
Volume II.	982
Volume III.	628
Volume IV.	838
	3635

Total number of synonyms (in Italic type):

Volume I.	2446
Volume II.	2104
Volume III.	1243
Volume IV.	1689
	7482

Total number of species in supplementary lists (in Italic type):

Volume I.	2351
Volume II.	864
Volume III.	576
Volume IV.	733
	4524

Total number of Latin binomial and trinomial plant names accounted for (approximate)........24434

III. THE NUMBER OF SPECIES (IN BLACK-FACED TYPE) NATIVE TO NORTH AMERICA NORTH OF MEXICO:

Volume I.	668
Volume II.	631
Volume III.	416
Volume IV.	704
	2419

IV. THE DATES OF PUBLICATION:

Volume I.	February 14, 1900
Volume II.	July 18, 1900
Volume III.	April 23, 1901
Volume IV.	February 26, 1902

COLLABORATORS

I. LIST OF CONTRIBUTORS TO THE CYCLOPEDIA

*_The asterisk designates the contributors to the fourth volume. Many of the contributors have also assisted in reading proofs and in other ways._

*ADAMS, GEO. E., Asst. Horticulturist, R. I. Exp. Sta., Kingston, R. I. (_Rhode Island. Rhubarb._)

*ADAMS, J. W., Nurseryman, Springfield, Mass. (_Stephanandra. Viburnum._)

*ALLEN, C. L., Author of "Bulbs and Tuberous-rooted Plants," Floral Park, N. Y. (_Tulipa._)

AMES, OAKES, Asst. Dir. Botanic Garden, and Instructor in Botany in Harvard Univ., Cambridge, Mass. (_Several genera of orchids._)

ANDREWS, D. M., Nurseryman, Boulder, Colo. (_Œnothera. Opuntia. Help on native western plants, especially hardy cacti._)

ARCHDEACON & Co., Commission merchants, New York, N. Y. (_Mushroom._)

ARNOLD, Jr., GEO., Gardener (formerly grower of aster seed), Rochester, N. Y. (_China Aster._)

ATKINS, F. L., Florist, Rutherford, N. J. (_Platycerium._)

ATKINSON, GEO. F., Prof. of Botany, Cornell Univ., Ithaca, N. Y. (_Mushroom._)

*BALMER, Prof. J. A., formerly Horticulturist, Wash. Exp. Sta. (_Washington._)

*BARCLAY, F. W., Gardener, Haverford, Pa. (_Herbaceous Perennials, Rhexia, Sanguinaria, Silphium, Sisyrinchium, Smilacina, Statice, and many others, mostly hardy herbs._)

*BARKER, MICHAEL, Editor of "Gardening" and "American Florist," Chicago, Ill. (_Solandra. Vallota. Many suggestions._)

*BARNES, CHARLES R., Prof. of Plant Physiology, Univ. of Chicago, Chicago, Ill. (_Fertilization. Flower. Teratology. Has read proofs of physiological subjects._)

BARNES, WILLIAM H., Secretary Kans. State Hort. Soc., Topeka, Kans. (_Kansas._)

*BARRON, LEONARD, Editor "American Gardening," New York, N. Y. (_Rose._)

BAYERSDORFER, H., Dealer in florists' supplies, Philadelphia, Pa. (_Everlasting Flowers._)

*BEACH, Prof. S. A., Horticulturist, N. Y. Exp. Sta., Geneva, N. Y. (_Corn. Thinning Fruit._)

BEADLE, C. D., Botanist and horticulturist, Biltmore, N. C. (_Bamboo._)

BEAL, W. J., Prof. of Botany. Mich. Agric. College, Agricultural College, Mich. (_Grass. Has read proofs of many genera of grasses._)

BECKERT, THEO. F., Florist, Allegheny City, Pa. (_Bougainvillæa._)

*BERCKMANS, P. J., Pomologist and nurseryman, Augusta, Ga. (_Lawns for the South. Magnolia. Melia. Michelia. Persimmon. Pomegranate. Trees. Vines. Has read proof of many groups of importance in the South._)

*BESSEY, CHARLES E., Prof. of Botany, Univ. of Nebr., Lincoln, Nebr. (_Plant. Trees for the Plains. Has read several articles on grasses and native plants._)

BLAIR, Prof. J. C., Horticulturist, Ill. Exp. Sta., Champaign, Ill. (_Greenhouse Glass. Illinois._)

*BRANDEGEE, Mrs. KATHARINE, Botanist, editor of Zoë, San Diego, Calif. (_Several genera of cacti, as Mammillaria, Melocactus, Pelecyphora, Pereskia, Phyllocactus, Pilocereus, Rhipsalis._)

BRANDEGEE, T. S., Botanist, San Diego, Calif. (_Nolina._)

*BRAUNTON, ERNEST, Landscape gardener, and editor of "California Floriculturist," Los Angeles, Calif. (_Nerium, Palms, Phœnix, Pittosporum, Richardia, Rose, Schinus, Trees, Vines, and other plants cultivated in southern California._)

*BRUCKNER, NICHOL N., Dreer's Nursery, Riverton, N. J. (_The article "Fern." Many groups of tender ferns. Selaginella._)

*BUDD, J. L., Prof. Emeritus of Horticulture, Iowa Agric. Coll., Ames, Ia. (_Roses for the Prairie States. Has read proof of Iowa and of articles on important fruits._)

*BUFFUM, Prof. B. C., Horticulturist, Wyo. Exp. Sta., Laramie, Wyo. (_Wyoming._)

BURBANK, LUTHER, Plant-breeder, Santa Rosa, Calif. (_Nicotiana. Has read proofs of Gladiolus, etc._)

BURNETTE, Prof. F. H., Horticulturist, La. Exp. Sta., Baton Rouge, La. (_Louisiana._)

BURRILL, T. J., Prof. of Botany and Horticulture, Univ. of Ill., Urbana, Ill. (_Protoplasm._)

Butz, Prof. Geo. C., Horticulturist, Pa. Exp. Sta., State College, Pa. (*Carnation. Pennsylvania.*)

*Cameron, Robert, Gardener, Botanic Garden of Harvard Univ., Cambridge, Mass. (*Various articles and much help on rare plants. Alpinia, Campanula, Echinocactus, Nemophila, Primula, Ramonda, Urceolina, etc.*)

*Canning, Edward J., Gardener, Smith College, Botanic Gardens, Northampton, Mass. (*Many articles and much help on rare and difficult plants. Anthurium. Echinocactus. Epiphyllum. Gloxinia. Peat. Puya. Soil. Stocks. Stove Plants. Vines. Zingiber.*)

*Card, Prof. Fred W., Horticulturist, R. I. Exp. Sta. Kingston, R. I. (*Nebraska. Botany and culture of bush-fruits, as Amelanchier, Berberis, Blackberry, Buffalo Berry, Currant, Loganberry, Raspberry, Ribes.*)

Clinkaberry, Henry T., Gardener, Trenton, N. J. (*Certain orchids, as Lælia.*)

*Clinton, L. A., Asst. Agriculturist, Cornell Exp. Sta., Ithaca, N. Y. (*Soy Bean. Spurry.*)

*Close, C. P., Horticulturist, Del. Exp. Sta. (formerly Horticulturist Utah Exp. Sta.), Newark, Del. (*Utah.*)

Coates, Leonard, Fruit-grower, Napa, Calif. (*Olive. Orange. Has helped on other fruits.*)

Cockerell, T. D. A., Entomologist, East Las Vegas, N. M. (*New Mexico.*)

Collins, John S., Fruit-grower, Moorestown, N. J. (*Pear.*)

*Conard, Henry S., Senior Fellow in Botany, Univ. of Pa., Philadelphia, Pa. (*Nymphæa. Victoria.*)

Cook, O. F., Botanist in charge of investigations in Tropical Agriculture, Div. of Botany, U. S. Dept. Agric., Washington, D. C. (*Coffee. Paritium. Help on Porto Rico, Sechium, Zingiber, and tropical plants.*)

*Corbett, Prof. L. C., Horticulturist, Bureau of Plant Industry, U. S. Dept. Agric., formerly Horticulturist, W. Va. Exp. Sta., Morgantown, W. Va. (*Storage. West Virginia.*)

*Coulston, Mrs. M. B., Formerly assistant editor of "Garden and Forest," Ithaca, N. Y. (*Various native plants. Stiles.*)

Coulter, John M., Professor and Head of the Dept. of Botany, Univ. of Chicago, Chicago, Ill. (*Echinocactus.*)

*Cowell, Prof. John F., Dir. Buffalo Botanic Garden, West Seneca, N. Y. (*Odontoglossum. Phormium. Rhus. Robinia. Sambucus. Symphoricarpos. Tilia.*)

*Cowen, J. H., formerly Assistant in Horticulture, Colo. Exp. Sta., died 1900. (*Certain Colorado plants, as Lepachys, Leucocrinum. Verbena.*) See personal note under "Verbena."

*Craig, John, Prof. of Extension Teaching in Agric., Cornell Univ., Ithaca, N. Y. (*Canada. Gooseberry. Kale. Kohlrabi. Pomology. Quince. Rape. Spraying. Thinning Fruit.*)

Craig, Robert, Florist, Philadelphia, Pa. (*Araucaria. Ardisia. Codiæum.*)

Craig, W. N., Gardener, North Easton, Mass. (*Mushroom.*)

Crandall, Prof. C. S., Div. of Forestry, U. S. Dept. Agric., Washington, D. C. (*Colorado.*)

*Cropp, Carl, Seedsman, Vaughan's Seed Store, Chicago, Ill. (*Stocks.*)

Culbertson, H., El Cajon Packing Company, El Cajon, Calif. (*Peach.*)

Cushman, E. H., Gladiolus specialist, Sylvania, Ohio. (*Gladiolus.*)

*Darlington, E. D., Superintendent of Trials, Fordhook Experimental Farm, Doylestown, Pa. (*Sweet Pea. Helped on Pea.*)

Darlington, H. D., Wholesale florist, specialist in heaths and hard-wooded plants, Flushing, N. Y. (*Epacris. Leptospermum. Pimelea. Has read proof of many articles on hard-wooded plants*)

*Davis, K. C., Horticulturist, W. Va. Exp. Sta., Morgantown, W. Va. (*All genera in Ranunculaceæ, e. g., Clematis, Nigella, Pæonia, Ranunculus. Help on West Virginia.*)

*Davy, J. Burtt, Asst. Botanist, Univ. of Calif. Exp. Sta., Berkeley, Calif. (*Trees and Vines of California, various Myrtaceæ, and many important subtropical subjects, as Acacia, Callistemon, Eugenia, Eucalyptus, Maytenus, Pittosporum, Psidium, Romneya, Schinus, Sollya, Streptosolen, Tristania, Umbellularia, Washingtonia, Windbreaks, and others.*)

*Dawson, Jackson, Gardener, Arnold Arboretum, Jamaica Plain, Mass. (*Rose.*)

Dean, James, Florist, Bay Ridge, N. Y. (*Nephrolepis.*)

Deane, Walter, Botanist, Cambridge, Mass. (*Herbarium. Has read many proofs and helped on various botanical problems.*)

Dewey, Lyster H., Office of Botanical Investigations, U. S. Dept. Agric., Washington, D. C. (*Mentha. Phytolacca.*)

Dorner, Fred, Carnation specialist, Lafayette, Ind. (*Carnation.*)

*Dorsett, P. H., Associate Physiologist and Pathologist, U. S. Dept. Agric., Washington, D. C. (*Violet*)

Douglas, Thos. H., of R. Douglas' Sons, nurserymen and specialists in conifers, Waukegan, Ill. (*Larix. Picea. Pseudotsuga.*)

Drew, E. P., Manager Rocky River Nursery, Clifton, Park, O. (*Picea.*)

Duggar, B. M., Div. Veg. Phys. & Path., U. S. Dept. Agric., Washington, D. C. (*Photosynthesis. Physiology of Plants. Pollen.*)

Dunning, D. M., Amateur, Auburn, N. Y. (*Grapes under Glass.*)

Dupuy, Louis, Wholesale florist and specialist in hard-wooded plants, Whitestone, N. Y. (*Erica. Has read other articles on heath-like plants.*)

***Earle**, Prof. F. S., Botanist at N. Y., Botanical Garden, Bronx Park, N. Y., formerly Horticulturist, Ala. Polytechnic Institute, Auburn, Ala. (*Alabama. Packing. Storage.*)

Earle, Parker, Horticulturist, Roswell, N. M. (*New Mexico.*)

***Egan**, W. C., Amateur, Highland Park, Ill. (*Eremurus. Rose. Rudbeckia. Winter Protection. Has helped on hardy plants.*)

Eisele, Jacob D., Manager of Dreer's Nursery, Riverton, N. J. (*Cordyline. Pandanus. Has read proofs of several important subjects*)

Elliott, William H., Florist, Brighton, Mass. (*Asparagus plumosus.*)

Emery, S. M., Dir. Mont. Exp. Sta., Manhattan, Mont. (*Montana.*)

Endicott, John, Bulb-grower, Canton, Mass (*Littonia.*)

Endicott, W. E., Teacher, Canton, Mass. (*Achimenes. Acidanthera. Ixia. Has made important corrections in many articles on bulbs.*)

***Evans**, J. C., Pres. Olden Fruit Co., Kansas City, Mo. (*Storage.*)

Evans, Walter H., Office of Exp. Stations, U. S. Dept. Agric., Washington, D. C. (*Alaska.*)

***Falconer, William**, Supt. Bureau of Parks, Pittsburg, Pa. (*Romneya.*)

***Fawcett, Wm.**, Director Dept. Public Gardens and Plantations, Kingston, Jamaica. (*The article "Tropical Fruits;" also Cherimoya, Cinchona, Marmalade Plum, Egg Fruit, Mango, Mangosteen, and others.*

Fernow, Prof. B. E., Director College of Forestry, Cornell Univ., Ithaca, N. Y. (*Conifers. Forestry. Pine.*)

Finlayson, Kenneth, Gardener, Brookline, Mass. (*Diosma.*)

Fletcher, Prof. S. W., Horticulturist, Wash. Exp. Sta., Pullman, Wash. (*Ipomœa and various other Convolvulaceæ. Helianthus and related genera. Nemophila. Nierembergia. Nolana. Pollination.*)

Foord, J. A., Asst. in Dairy Husbandry, Cornell Univ., Ithaca, N. Y. (*New Hampshire.*)

Franceschi, Dr. F , Manager S. Calif. Acclimatizing Ass'n, Santa Barbara, Calif. (*Rare plants grown in S. Calif., as Dasylirion, Flacourtia, Fouquiera, Furcræa, Hazardia, Parkinsonia, etc. Has corrected many proofs.*

Galloway, B. T., Dir. of Bureau of Plant Industry, U. S. Dept. Agric., Washington, D. C. (*Floriculture. Has read various important articles, including Violet.*)

Gannett, Frank E., Editor, "The News," Ithaca, N. Y.; formerly Sec'y to President of the U. S. Philippine Commission. (*Philippine Islands.*)

Garcia, Prof. Fabian, Horticulturist New Mex. Exp. Sta., Mesilla Park, N. M. (*New Mexico*).

Garfield, Chas. W., Horticulturist, Grand Rapids, Mich. (*Michigan.*)

Gerard, J. N., Amateur, Elizabeth, N. J. (*Various articles, especially on bulbous plants, as Crocus, Iris, Muscari, Narcissus.*)

Gillett, Edward, Nurseryman, Southwick, Mass. (*Hardy Ferns. Liparis. Has read numerous proofs on native plants, especially hardy orchids.*)

***Goff**, Prof. E. S., Horticulturist, Wis. Exp. Sta., Madison, Wis. (*Wisconsin.*)

***Good, Jessie** M., Organizer, American League for Civic Improvement, Springfield. O. (*Village Improvement.*)

Gould, H. P., Div. of Pomology, U. S. Dept. Agric., Washington, D. C. (*Brussels Sprouts. Celeriac.*)

Gould, Mrs. **Thos.**, Petunia specialist, Ventura, Calif. (*Petunia.*)

Green, Prof. S. B., Horticulturist, Minnesota, Exp. Sta., St. Anthony Park, Minn. (*Minnesota.*)

Green, Wm. J. Horticulturist, Ohio Exp. Sta., Wooster, Ohio. (*Ohio. Greenhouse sub-irrigation.*)

Greene, Edward L., Prof. of Botany, Catholic Univ. of America, Washington, D. C. (*Dodecatheon. Help on Viola.*)

Greenlee, Miss **Lennie**, Bulb-grower, Garden City, N. C. (*Ixia.*)

***Greiner**, T., Specialist in Vegetables, La Salle, N. Y. (*Garden vegetables, as Artichoke, Asparagus, Bean, Cress, Corn Salad, Kohlrabi, Lettuce, Onion, Parsley, Parsnip, Rhubarb.*)

***Grey, Robert** M., Gardener, North Easton, Mass. (*Numerous important orchid groups, as Cypripedium, Epidendrum, Lycaste, Maxillaria, Masdevallia, Odontoglossom, Oncidium, Orchid, Phalænopsis, Saccolabium, Stanhopea, Zygopetalum.*)

Groff, H. H., Gladiolus specialist, Simcoe, Ont. (*Gladiolus.*)

Gurney, James, Gardener, Mo. Botanical Garden, St. Louis, Mo. (*Cacti.*)

***Hale**, J. H., Nurseryman and pomologist, South Glastonbury, Conn. (*Connecticut. Peach. Storage.*)

Halsted, Prof. B. D., N. J. Exp. Sta., New Brunswick, N. J. (*Diseases. Fungus.*)

Hansen, Geo., Landscape Architect and botanist, Berkeley, Calif. (*Epidendrum.*)

*Hansen, Prof. N. E., Horticulturist, S. Dak. Exp. Sta., Brookings, S. Dak. (*South Dakota.*)

Harris, Frederick L., Gardener, Wellesley, Mass. (*Lisianthus. Medinilla.*)

*Harris, W., Supt. of Hope Gardens, Kingston, Jamaica. (*Certain tropical fruits, as Mammee Apple, Persea, Pomelo, Tamarind, etc.*)

Harris, W. K., Florist, Philadelphia, Pa. (*Ficus elastica. Help on Lilium Harrisii.*)

Harrison, C. S., Pres. Park and Forest Soc. of Neb., York, Neb. (*Pseudotsuga.*)

*Harshberger, J. W., Instructor in Botany, Univ. of Penn., Philadelphia, Pa. (*Rust. Saprophyte. Scilla. Smut. Symbiosis.*)

*Hart, J. H., Supt. Botanical Department, Trinidad, W. I. (*Theobroma. Tropical Fruits.*)

*Hasselbring, Heinrich, Asst. Pathologist, Ill. Exp. Sta., Urbana, Ill. (*Iris. The article "Orchids," and botany of most orchid genera from Gongora to Zygopetalum. Several acanthads, as Schaueria and Thunbergia. Also Rust, and has helped on plant diseases.*)

Hastings, G. T., formerly Asst. in Botany, Cornell Univ., Ithaca, N. Y.; now Science Teacher, Santiago, Chile. (*Some tropical plants, as Berria, Bertholletia. A few grasses, as Hierochloe, Holcus, Hordeum.*)

*Hatfield, T. D., Gardener, Wellesley, Mass. (*Numerous and varied contributions, as Gesnera, Gloxinia, Lachenalia, Leea, Macrozamia, Œnothera, Oxalis, Pelargonium, Reinwardtia, Rhexia, Richardia, Rondeletia. Has read many proofs.*)

Hedrick, U. P., Asst. Prof. of Horticulture, Agricultural College, Mich. (*Evaporation of Fruit. Prune. Help on Utah.*)

*Heinz Co., H. J., Manufacturers of pickles and canned goods, Pittsburg, Pa. (*Tomato.*)

Henderson & Co., Peter, Seedsmen, New York, N. Y. (*Bulbs. Eccremocarpus. Polianthes. Much help on proofs and many suggestions.*)

Henderson, Prof. L. F., Botanist, Idaho Exp. Sta., Moscow, Idaho. (*Phacelia.*)

Herrington, A., Gardener, Florham Farms, Madison, N. J. (*Chrysanthemum coccineum. Hollyhock.*)

Hews, A. H., Manufacturer of earthenware, North Cambridge, Mass. (*Pots.*)

*Hexamer, Dr. F. M., "American Agriculturist," New York, N. Y. (*Several biographical sketches, as Fuller, Harris, Thurber.*)

*Hicks, G. H., late of U. S. Dept. Agric., Washington, D. C. (deceased). (*Seed-testing.*)

*Hicks, Henry, Nurseryman, Westport, L. I. (*Ligustrum. Transplanting.*)

Higgins, J. E., Horticulturist and teacher, Honolulu, H. T. (*Hawaiian Islands.*)

Hill, E. G., Florist, Richmond, Ind. (*Begonia.*)

*Hitchcock, A. S., Agrostologist, U. S. Dept. Agric., Washington D. C. (*Most of the genera of grasses from E to Z.*)

Hollister, E. J., Celery cultivator, Holley, Colo. (*Celery.*)

Hoopes, Josiah, Nurseryman, West Chester, Pa. (*Hedges.*)

Horsford, Fred H., Nurseryman, and specialist in lilies, Charlotte, Vt. (*Alpine Gardens. Lilium. Has read proof of many articles on native plants and hardy herbaceous perennials.*)

*Huey, Robert, Amateur rosarian, Philadelphia, Pa. (*Rose.*)

*Hunn, Charles E., Gardener, Cornell Exp. Sta. Ithaca, N. Y. (*Forcing of Vegetables. Mignonette. Strawberry.*)

Huntley, Prof. F. A., Horticulturist, Idaho Exp. Sta., Moscow, Idaho. (*Idaho.*)

*Hutchins, Rev. W. T., Sweet Pea specialist, Springfield, Mass. (*Sweet Pea.*)

*Irish, H. C., Horticulturist, Mo. Botanical Garden, St. Louis, Mo. (*Capsicum. Lactuca. Pepper. Tetragonia.*)

*Jacob Chas. W., & Allison, Importers, New York, N. Y. (*Raffia.*)

*Jackson & Perkins Co., Nurserymen and specialists in Clematis, Newark, N. Y. (*Clematis. Rose.*)

Jaenicke, Adolph, Manager propagating dept., J. L. Childs, Floral Park, N. Y. (*Primula.*)

Jeffers, A., Editor "Cornucopia," Norfolk, Va. (*Kale. Potato.*)

Jordan, A. T., Asst. Horticulturist, New Brunswick, N. J. (*New Jersey.*)

*Junghanns, R. L., San Juan, Porto Rico. (*Reseda. Help on Mignonette.*)

*Kains, M. G., Horticulturist, School of Practical Agric. and Hort., Briar Cliff Manor, N. Y. (*Minor vegetables, as Horse-Radish, Okra and Roquette. The article Sweet Herbs, also Sage, Savory, Scurvy Grass, Tansy, and other sweet, pot or medicinal herbs. Also Chicory, Ginseng and Glycyrrhiza.*)

Kearney, T. H., Div. of Veg. Phys. and Path., U. S. Dept. Agric., Washington, D. C. (*Three orchid genera, Grammangis, Grammatophyllum, Habenaria.*)

*Keller, J. B., Florist, Rochester, N. Y. (*Many groups of hardy herbaceous perennials. Article on Herbaceous Perennials.*)

Kelsey, Harlan P., Nurseryman, Boston, Mass. (*North Carolina plants, as Galax, Leucothoë and Paronychia. Help on proofs.*)

Kennedy, P. Beveridge, Horticulturist, Nev. Exp. Sta., Reno, Nev. (_Many genera of grasses in Vols. I and II. Begonia._)

Kerr, J. W., Nurseryman, Denton, Md. (_Maryland. Help on Plum._)

Kift, Robert, Florist, Philadelphia, Pa. (_Cut-flowers._)

Kinney, L. F., Horticulturist, Kingston, R. I. (_Celery._)

Knapp, S. A., Special commissioner U. S. Dept. Agric., Lake Charles, La. (_Philippine Islands._)

Lager & Hurrell, Orchid cultivators, Summit, N. J. (_Cattleya._)

Lager, John E., Orchid specialist, Summit, N. J. (_Oncidium._)

Lake, Prof. E. R., Horticulturist, Ore. Exp. Sta., Corvallis, Ore. (_Oregon._)

Landreth, Burnet, Seedsman, Philadelphia, Pa. (_David Landreth._)

Lauman, G. N., Instructor in Hort., Cornell Univ., Ithaca, N. Y. (_Geranium. Impatiens._)

*Le Moyne, F. J., Amateur in orchids, Chicago, Ill. (_Sobralia._)

Lewers, Ross, Fruit-grower, Franktown, Nev. (_Nevada._)

*Linton, S. H., Nurseryman, Des Moines, Ia. (_Rhubarb._)

Lonsdale, Edwin, Florist, Wyndmoor, Chestnut Hill, Philadelphia, Pa. (_Conservatory._)

Lord & Burnham Co., Horticultural architects and builders, Irvington-on-Hudson, N. Y. (_Greenhouse Construction._)

Lothrop & Higgins, Dahlia specialists, East Bridgewater, Mass. (_Dahlia._)

Lyon, T. T., Pomologist, South Haven, Mich. (Died 1900.) (_Pear._)

*MacDougal, D. T., Dir. of the Laboratories, N. Y. Botanical Garden, Bronx Park, N. Y. (_Sap. Transpiration._)

Macomber, J. T., Fruit-grower, Grand Isle, Vt. (_Peach._)

MacPherson, James, Landscape gardener, Trenton, N. J. (_Euphorbia. Has read proofs of several orchid genera._)

McFarland, J. Horace, Horticultural printer and expert in photography, Harrisburg, Pa. (_Border. Photography. Help on illustrations._)

McKay, Prof. A. B., Horticulturist, Miss. Exp. Sta., Agricultural College, Miss. (_Potato. Strawberry._)

McMillen, Robert, Wholesale grower of mignonette, Pearl River, N. Y. (_Mignonette._)

McWilliam, Geo., Gardener, Whitinsville, Mass. (_Dipladenia. Luculia._)

*Manning, J. Woodward, Landscape Architect, Boston, Mass. (_Pachysandra. Pyrethrum. Rhododendron. Hardy herbs. Many proofs._)

*Manning, Warren H., Landscape Architect, Boston, Mass. (_Herbaceous Perennials. Rock Gardens._)

Mason, Prof. S. C., Dept. of Horticulture and Forestry, Berea College, Berea, Ky. (_Labeling. Layering._)

Massey, Prof. W. F., Horticulturist, N. C. Exp. Sta., Raleigh, N. C. (_Fig. North Carolina._)

Mathews, Prof. C. W., Horticulturist, Ky. Exp. Sta., Lexington, Ky. (_Kentucky._)

Mathews, F. Schuyler, Artist, Boston, Mass. (_Color._)

*Mathews, Wm., Florist and orchid grower, Utica, N. Y. (_Various orchids, as Gongora, Grammatophyllum, Ionopsis, Limatodes, Miltonia, Pholidota, Selenipedium, Sophronitis. Has read many proofs on orchids._)

*May, John N., Wholesale florist, Summit, N. J. (_Rose. Help on florists' flowers._)

Maynard, Prof. S. T., Horticulturist, Mass. Hatch. Exp. Sta., Amherst, Mass. (_Massachusetts._)

Mead, T. L., Horticulturist, Oviedo, Fla. (_Crinum. Orange. Has helped in matters of southern horticulture._)

*Meehan, Joseph, Nurseryman, Germantown, Philadelphia, Pa. (_Idesia. Toxylon._)

Meredith, A. P., Gardener, South Lancaster, Mass. (_Humea._)

*Mills, Rt. Rev. Edmund M., Amateur rosarian, Elmira, N. Y. (_Rose._)

*Mische, Emil, Asst. to Olmsted Bros., Landscape Architects, Brookline, Mass. (_Quisqualis. Toxylon._)

Moon, Samuel C., Nurseryman, Morrisville, Pa. (_Oak._)

Morrill, Roland, Fruit-grower, Benton Harbor, Mich. (_Peach._)

Morris, O. M., Horticulturist, Okla. Exp. Sta., Stillwater, Okla. (_Indian Territory. Oklahoma._)

*Mott, Jr., Samuel R., Manager of Genesee Fruit Co.'s Freezing and Cold Storage Dept., Rochester, N. Y. (_Storage._)

*Munson, T. V., Nurseryman and grape hybridist, Denison, Tex. (_Grape culture in the South. Texas._)

*Munson, Prof. W. M., Horticulturist, Me. Exp. Sta., Orono, Me. (_Maine. Vaccinium._)

*Murrell, Geo. E., Fruit-grower, Fontella, Va. (_Virginia._)

*Nehrling, H., Milwaukee, Wis. (_Phœnix, Sabal, Serenœa, Tabernæmontana, Tecoma, Thunbergia and other plants cultivated in his garden at Gotha, Fla._)

Newbury, H. E., Specialist in tuberose culture, Magnolia, N. C. (_Polianthes._)

Newell, A. J., Gardener, Wellesley, Mass. (*Certain orchids*, e.g., *Odontoglossum.*)

***Newman**, J. S., Vice Dir. S. C. Exp. Sta., Clemson College, S. C. (*South Carolina.*)

***Norton**, Prof. J. B. S., Pathologist Md. Exp. Sta., College Park, Md. (*Genera of Euphorbiaceæ. Phyllanthus. Numerous botanical puzzles.*)

Ogston, Colin, Gardener, Kimball orchid collection, Rochester, N. Y. (*Dendrobium.*)

***Oliver**, G. W., Bureau of Plant Industry, U. S. Dept. Agric., Washington, D. C. (*Many articles on palms, aroids, succulents and rare plants, and much help on proofs. Alstrœmeria. Amaryllis. Nepenthes. Ochna. Pennisetum. Petrea. Sarracenia.*)

Olmsted, Jr., F. L., Landscape Architect, Brookline, Mass. (*Park. Help on Landscape and Railroad Gardening.*)

O'Mara, Patrick, of Peter Henderson & Co., New York, N. Y. (*Potting. Has read various important articles, suggested contributors and given other aid.*)

Orpet, Edward O., Gardener, So. Lancaster, Mass. (*Border. Cyclamen. Dianthus, and certain orchids.*)

Parsons, Jr., **Samuel**, Landscape architect, New York, N. Y. (*Lawn. Help on Park.*)

Peacock, Lawrence K., Dahlia specialist, Atco, N. J. (*Dahlia.*)

Pennock, F. M., Horticulturist, San Juan, Porto Rico. (*Porto Rico.*)

***Peterson**, **Wm.** A., of the firm of P. S. Peterson & Son, Nurserymen, Chicago, Ill. (*Pæonia. Transplanting of large trees.*)

***Pierce, Newton** B., Pathologist Pacific Coast Laboratory, Div. of Veg. Phys. and Path., U. S. Dept. Agric., Santa Ana, Calif. (*Walnut.*)

***Pieters**, A. J., Botanist in charge of Seed Laboratory, Bureau of Plant Industry, U. S. Dept. Agric., Washington, D. C. (*Seed Testing.*)

Powell, Prof. G. **Harold**, Div. of Pomology, U. S. Dept. Agric., Washington, D. C. (*Cherry. Delaware. Help on Peach, etc.*)

Powell, George T., Dir. School of Practical Agriculture and Horticulture, Briar Cliff Manor, N. Y. (*Pear. Has read proofs of other important fruits.*)

***Price**, Prof. R. H., Horticulturist, Texas Exp. Sta., College Station, Texas. (*Texas.*)

Prince, L. B., Pres. Board of Regents, New Mexico Agric. College, Santa Fe, N. M. (*The article "Prince."*)

***Purdy, Carl**, Specialist in California bulbs, Ukiah, Calif. (*California native plants, as Brodiæa, Calochortus, Erythronium, Fritillaria, Stropholirion. Help on Lilium.*)

Rane, F. W., Horticulturist and Prof. of Horticulture, N. H. College, Durham, N. H. (*New Hampshire.*)

Rawson, Grove P., Florist, Elmira, N. Y. (*Lantana.*)

Rawson, W. W., Seedsman and market-gardener, Boston, Mass. (*Cucumber. Lettuce.*)

***Reasoner**, E. N., Nurseryman and horticulturist, Oneco, Fla. (*Many articles, and much help on extreme southern horticulture. Cæsalpinia. Cocos. Guava. Kumquat. Lemon. Lime. Mango. Musa. Orange. Sabal. Tamarindus.*)

***Rehder, Alfred**, Asst. at the Arnold Arboretum, Jamaica Plain, Mass. (*Botany and culture of most of the hardy trees and shrubs. The article "Trees."*)

Roberts, Prof. I. P., Dir. College of Agric., Cornell Univ., Ithaca, N. Y. (*Drainage. Fertility. Manure. Potato.*)

Rolfs, Prof. P. H., Botanist, S. C. Exp. Sta., Clemson College, S. C. (*Eggplant. Florida. Okra. Onion. Pineapple.*)

Rose, J. N., Asst. Curator, U. S. Nat. Herb., Smithsonian Institution, Washington, D. C. (*Agave. Prochnyanthes.*)

Rose, N. **Jonsson**, Landscape Gardener, Dept. of Parks, New York, N. Y. (*Various exotics.*)

Roth, Filibert, Chief of Div. of Forestry, Department of the Interior, Washington, D. C. (*Fagus.*)

***Rowlee**, Prof. W. W., Asst. Prof. of Botany, Cornell Univ., Ithaca, N. Y. (*Liatris. Salix.*)

Royle, Mrs. **Emily Taplin**, Asst. Ed. "Rural New-Yorker," New York, N. Y. (*Nepenthes.*)

***Sandsten**, Prof. E. P., Horticulturist Md. Exp. Sta., College Park, Md. (*Self-sterility.*)

Sargent, Prof. C. S., Dir. Arnold Arboretum, Jamaica Plain, Mass. (*Abies. Has read proofs of Picea. Prunus, etc.*)

***Scott**, **Wm.**, Florist, Buffalo, N. Y. (*Important florists' plants and flowers, as Acacia, Convallaria, Cyclamen, Cytisus, Smilax, Metrosideros, Peperomia, Perilla, Piqueria, Stephanotis, Syringa, Verbena, etc. Also Packing Flowers.*)

Scott, **Wm.**, Gardener, Tarrytown, N. Y. (*Bertolonia and other tender foliage plants.*)

***Scribner**, F. **Lamson**, Dir. Dept. of Agric., Philippine Islands, formerly Chief Div. of Agrostology, U. S. Dept. Agric., Washington, D. C. (*Teosinte.*)

***Sears**, Prof. F. C, Dir. Nova Scotia School of Horticulture, Wolfville, N. S., formerly Horticulturist Utah Exp. Sta. (*Utah. Help on Canada.*)

***Seavey**, Mrs. **Frances Copley**, Landscape Gardener, Chicago, Ill. (*Railroad Gardening.*)

Semple, James, Specialist in China asters, Bellevue, Pa. (*Aster.*)

Sexton, Joseph, Founder of the pampas grass industry, Goleta, Calif. (*Gynerium.*)

*Shepard, Charles U., Special agent U. S. Dept. Agric. in charge of experiments in tea culture, Summerville, S. C. (*Tea.*)

*Shinn, Charles H., Inspector of Experiment Stations, Univ. of Calif., Berkeley, Calif. (*California, Fig, Loganberry, Sequoia, etc.*)

*Shore, Robert, Gardener, Botanical Dept., Cornell Univ., Ithaca, N. Y. (*Various articles, as Acalypha, Bedding, Dichorisandra, Episcea, Fittonia, Hymenophyllum, Thyrsacanthus, Trachelospermum, Vases.*)

*Siebrecht, Henry A., Florist and nurseryman, New York and Rose Hill Nurseries, New Rochelle, N. Y. (*Much help on rare greenhouse plants, particularly orchids and palms. Dracæna. Ficus. Fuchsia. Gardenia. Ixora. Lapageria. Laurus. Nerium. Nepenthes. Puya. Sonerila. Tococa, and others.*)

*Simonds, O. C., Landscape Gardener, Buena Ave., Chicago, Ill. (*Landscape Cemeteries. Shrubbery.*)

Slingerland, Prof. M. V., Entomologist Cornell Exp. Sta., Ithaca, N. Y. (*Insecticides. Insects.*)

Smith, A. W., Grower of cosmos and moonflower seed, Americus, Ga. (*Cosmos.*)

Smith, Elmer D., Chrysanthemum specialist, Adrian, Mich. (*Chrysanthemum.*)

Smith, Irving C., Market-gardener, Green Bay, Wis. (*Onion. Help on Kohl-Rabi and Strawberry.*)

*Smith, Jared G., Dir. Hawaii Exp. Sta., Honolulu, H. Terr. (*Nearly all palms, some aroids and various other genera, as Centaurea, Cerastium, Cotyledon.*)

*Smith, J. M. (deceased), Fruit-grower and market-gardener, Green Bay, Wis. (*Strawberry.*)

Spencer, John W., Fruit-grower, Westfield, Chautauqua Co., N. Y. (*Grapes in the North. Help on important fruits.*)

*Staley, Arthur, Walnut-grower, Fullerton, Calif. (*Walnut.*)

*Starnes, Hugh N., Prof. of Agriculture and Horticulture, Univ. of Georgia, Athens, Ga. (*Georgia. Sweet Potato. Tomato. Watermelon.*

Steele, E. S., Bureau of Plant Industry, U. S. Dept. Agric., Washington, D. C. (*Perfumery Gardening.*)

*Steele, W. C., Fruit-grower, Switzerland, Fla. (*Talinum. Help on floriculture in Florida.*)

Stinson, Prof. John T., Dir. Mo. Fruit Exp. Sta., Mountain Grove, Mo. (*Arkansas.*)

Strong, Wm. C., Nurseryman, Waban, Mass. (*Kenrick.*)

Stubbs, W. C., Dir. La. Exp. Sta., Baton Rouge, La. (*Orange.*)

*Stubenrauch, Arnold V., Instructor in Hort., Univ. of Ill., Urbana, Ill., formerly Calif. Exp. Sta. (*Olive, Plum and Raisin in Calif. Pilocarpus. Pimelea. Platycodon. Sequoia. Tulipa.*)

Taber, G. L., Nurseryman, Glen St. Mary, Fla. (*Persimmon.*)

Taft, Prof. L. R., Horticulturist, Mich. Agric. College, Agricultural College, Mich. (*Greenhouse heating. Hotbeds.*)

*Taplin, W. H., Specialist in palms and ferns, Holmesburg, Philadelphia, Pa. (*Culture of many palms, ferns and foliage plants.*)

Taylor, Frederic W., Dir. Dept. of Horticulture, Pan-American Exposition, Buffalo, N. Y. (*Nebraska.*)

Taylor, Wm. A., Asst. Pomologist, Div. of Pomology, U. S. Dept. Agric., Washington, D. C. (*Articles on nuts, as Hickory, Pecan.*)

Thilow, J. Otto, of H. A. Dreer, Inc., Philadelphia, Pa. (*Leek. Muskmelon.*)

Thompson, C. H., formerly Asst. Botanist, Mo. Botanical Garden, St. Louis, Mo. (*Some genera of cacti, as Echinocereus, Epiphyllum.*)

*Thorburn & Co., J. M., Seedsmen, New York, N. Y. (*Hyacinth. Seed Trade. Have read many proofs of bulbs, annuals, vegetables, herbs, etc.*)

*Toumey, Prof. J. W., Yale Forestry School, New Haven, Mass. (*Arizona. Date. Opuntia. Root-Galls.*)

Tracy, S. M., Horticulturist, Biloxi, Miss. (*Mississippi.*)

*Tracy, W. W., Seedsman, D. M. Ferry & Co., Detroit, Mich. (*Cabbage. Lettuce. Michigan. Pea. Radish. Seedage. Help on many vegetables.*)

*Trelease, Dr. Wm., Dir. Mo. Botanical Garden, St. Louis, Mo. (*Certain desert plants of the lily family, as Aloe, Apicra, Gasteria, Haworthia, Yucca. Shaw. Sturtevant. Oxalis.*)

*Tricker, Wm., Specialist in aquatics, Dreer's Nursery, Riverton, N. J. (*Aquarium. Aquatics. Most aquatics, as Limnanthemum, Limnocharis, Nymphæa, Nelumbo, Ouvirandra, Victoria.*)

Troop, Prof. James, Horticulturist, Ind. Exp. Sta., Lafayette, Ind. (*Indiana. Persimmon.*)

*Tucker, Gilbert M., Publisher and editor of "The Country Gentleman," Albany, N. Y. (*J. J. Thomas. Luther Tucker.*)

Turner, Wm., Gardener, Oceanic, N. J. (*Forcing of Fruits. Mushroom.*)

Tuttle, H. B., Cranberry-grower, Valley Junction, Wis. (*Cranberry.*)

*Underwood, Prof. L. M., Columbia University, New York, N. Y. (*Botany of all ferns. Selaginella and some other flowerless plants.*)

*Van Deman, H. E., Pomologist, Parksley, Va. (*Date. Nut Culture. Strawberry.*)

Vaughan, J. C., Seedsman and florist, Chicago and New York. (*Christmas Greens.*)

Vick, **James**, D. Landreth's Sons, Philadelphia, Pa. (*Malvaviscus. Melothria.*)

Voorhees, Prof. **Edward** B., Dir. N. J. Exp. Sta., New Brunswick, N. J. (*Fertilizers.*)

Waldron, Prof. C. B., Horticulturist, N. Dak. Exp. Sta., Fargo, N. Dak. (*North Dakota.*)

***Walker**, Prof. **Ernest**, Horticulturist, Ark. Exp. Sta., Fayetteville, Ark. (*Annuals. Basket Plants. Heliotrope. Watering.*)

Ward, C. W., Wholesale florist, Queens, L. I. (*Pelargonium. Help on Carnation.*)

***Warder**, R. H., Supt. Lincoln Park, Chicago, Ill. (*Warder.*)

***Watrous**, C. L., Nurseryman and pomologist, Des Moines, Io. (*Iowa. Pear. Trees on Plains.*)

***Watson**, B. M., Instructor in Horticulture, Bussey Inst., Jamaica Plain, Mass. (*Colchicum. Cuttage. Forcing Hardy Plants. House Plants. Rhododendron. Rose. Winter Protection.*)

***Watts**, R. L., formerly Horticulturist of Tennessee Exp. Sta., Scalp Level, Pa. (*Tennessee.*)

***Waugh**, Prof. F. A., Horticulturist, Vt. Exp. Sta., Burlington, Vt. (*Beet. Carrot. Cucumber. Greens. Lilium. Plum. Salad Plants. Vermont.*)

***Webber**, **Herbert** J., In charge of Plant Breeding Laboratory, Veg. Phys. and Path. Investigations, Bureau of Plant Industry, U. S. Dept. Agric., Washington, D. C. (*Citrus. Pomelo. Murraya, Triphasia, and other citrous genera. Plant-Breeding. Help on Zamia.*)

Wellhouse, **Fred**, Fruit-grower, Fairmount, Kans. (*Kansas.*)

Wheeler, C. F., Asst. Prof. of Botany, Michigan Agric. College, Mich. (*Pyrola.*)

Wheeler, H. J., Chemist, R. I. Exp. Sta., Kingston, R. I. (*Lime.*)

***Whitney**, **Milton**, Chief. Div. of Soils, U. S. Dept. Agric., Washington, D. C. (*Irrigation. Soils.*)

Whitten, Prof. J. C., Horticulturist, Mo. Exp. Sta., Columbia, Mo. (*Missouri.*)

Whyte, R. B., Amateur, Ottawa, Ont. (*Hemerocallis. Lilium. Narcissus. Papaver. Help on Tagetes, Tulipa, Zinnia, etc.*)

***Wickson**, **Edward** J., Prof. of Agricultural Practice, Univ. of Calif., and Horticulturist, Calif. Exp. Sta., Berkeley, Calif. (*Almond, Apricot, Cherry, Grape, Lemon, Lime, Nectarine, Pear, Strawberry, Walnut and Vegetable Gardening in California.*)

***Wiegand**, K. M., Instructor in Botany, Cornell Univ., Ithaca, N. Y. (*Coreopsis. Cordyline. Cyperus. Dracæna. Juncus. Lysimachia. Musa. Myosotis. Potentilla. Scirpus. Steironema.*)

***Woods**, **Albert** F., Chief of Office of Veg. Phys. Investigations, U. S. Dept. Agric., Washington, D. C. (*Variegation.*)

Woolson, G. C., Nurseryman, Specialist in hardy herbaceous perennials, Passaic, N. J. (*Mertensia. Has read numerous proofs.*)

Wortman, S. W., Mushroom-grower, Iselin, N. J. (*Mushroom.*)

Wright, **Charles**, Fruit-grower, Seaford, Del. (*Peach. Help on Delaware.*)

***Wyman**, A. P., Asst. to Olmsted Bros., Landscape Architects, Brookline, Mass. (*Dirca, Epigæa, Exochorda, Halesia, Hypericum, Kerria, Liquidambar, and other hardy trees and shrubs. Also Lathyrus, Lupinus, Veronica.*)

***Yeomans**, L. T., Fruit-grower, Walworth, N. Y. (*Pear. Help on Evaporation of Fruits. Raspberry.*)

Zirngiebel, **Denys**, Florist, Needham, Mass. (*Pansy.*)

II. LIST OF THOSE WHO HAVE ASSISTED BY READING PROOF, AND IN OTHER WAYS

Abraham, **Charles**, Nurseryman, San Francisco, Calif. (*Trees in Calif.*)

Allen, R. C., Fruit-grower, Bonita, Calif. (*Olive.*)

Alverson, A. H., Grower of cacti, San Bernardino, Calif. (*Cacti.*)

Apgar, **Austin** C., Prof. of Botany, N. J. State Normal School, author of "Trees of the Northern U. S.," Trenton, N. J. (*Trees.*)

Bailey, W. W., Prof. of Botany, Brown Univ., Providence, R. I. (*Rhode Island.*)

Ball, C. D., Wholesale florist, Holmesburg, Philadelphia, Pa. (*Palms and decorative plants.*)

Barker, **Charles**, Fruit-grower, Milford, Del. (*Peach.*)

Bassett & Son, Wm. F., Nurserymen, Hammonton, N. J. (*Native plants, as Hibiscus.*)

Beal, W. H., Office of Experiment Stations, U. S. Dept. Agric., Washington, D. C. (*Vigna.*)

Berger & Co., H. H., Importers, New York, N. Y. (*Japanese and Californian plants.*)

Betscher, C., Florist, nurseryman and seedsman, Canal Dover, Ohio. (*Gladiolus.*)

Blanc, A., Seedsman and plantsman, Philadelphia, Pa. (*Cacti. Canna. Novelties.*)

Boardman, S. L., Sec. Maine Hort. Soc., Augusta, Me. (*Maine.*)

Brackett, G. B., Pomologist, U. S. Dept. Agric., Washington, D. C. (*Hicoria. Hickory. Juglans.*)

Breck & Sons, Joseph (Corporation), Seedsmen, Boston, Mass. (*Portrait of Joseph Breck.*)

Breese, J. S., Nurseryman, Fayetteville, N. C. *North Carolina.*)

Brotherton, Wilfred, Mich. Wild Flower Co., Rochester, Mich. (*Native hardy herbaceous perennials.*)

Brown, O. H., Amateur, Bordentown, N. J. (*Aquatics.*)

Budlong & Son Co., J. A., Manufacturers of pickles and vinegar, market-gardeners, Providence, R. I. (*Cucumber. Martynia.*)

Bruggerhof, F. W., Seedsman, Pres. J. M. Thorburn & Co., New York, N. Y. (*Seed Trade. Various suggestions.*)

Burpee, W. Atlee, Seedsman, Philadelphia, Pa. (*Seed Testing.*)

Bush & Sons, Viticulturists, Bushberg, Mo. (*Grapes.)*

Caldwell, Geo. C., Prof. of Agric. Chemistry, Cornell Univ., Ithaca, N. Y. (*Fertility. Fertilizers. Lime.*)

Chamberlin, John, Journalist, Buffalo, N. Y. (*Native plants. Ranunculus.*)

Clark, Miss Josephine A., Librarian, U. S. Dept. Agric., and author of a card index of new species of North American plants, Washington, D. C. (*Information as to species after the date of Index Kewensis.)*

Clark, J. C., Dreer's nursery, Riverton, N. J. (*Pansy.*)

Coville, Frederick V., Botanist, Dept. of Agric. Washington, D. C. (*Juniperus. Suggestions on various matters.*)

Cranefield, Frederic, Asst. Horticulturist, Wisconsin Exp. Sta., Madison, Wis. (*Irrigation.*)

Dailledouze Bros., Wholesale florists, Flatbush, Brooklyn, N. Y. (*Mignonette.*)

Dailey, Charles L., Fruit-grower, Salem, Ore. (*Prune.*)

Danby, Charles E., Prune-grower, Salem, Ore. (*Prune.*)

Dandridge, Mrs. Danske, Amateur, Shepherdstown, W. Va. (*Hardy plants.*)

Davenport, Geo. E., Botanist, specialist in ferns, Medford, Mass. (*Several genera of ferns.*)

Day, Miss Mary A., Librarian, Gray Herbarium of Harvard Univ., Cambridge, Mass. (*Rare books.*)

Devol, W. S., Editor and agriculturist, Redlands, Calif. (*Vegetables in California.*)

Devron, Dr. G., Amateur of bamboos, New Orleans, La. (*Bamboo.*)

Dock, Miss M. L., Lecturer on plant life, forestry and village improvement, Harrisburg, Pa. (*Bartram. Village Improvement.*)

Dosch, H. E., Sec'y. State Board of Hort., Hillsdale, Ore. (*Oregon.*)

Downer's Sons, J. S., Fruit-growers, Fairport, Ky. (*Kentucky.*)

Dreer, Henry A. (Inc.), Seedsmen and Plantsmen, Philadelphia, Pa. (*Many and varied services, especially in aquatics, ferns, foliage plants and rare annuals.*)

Eisen, Gustav, Author of Gov't. bulletins on figs and raisins, San Francisco, Calif. (*Fig. Raisin.*)

Elliot, J. Wilkinson, Landscape Architect, Pittsburg, Pa. (*Kochia, Oak, and some herbaceous perennials.*)

Ellwanger & Barry, Nurseryman, Rochester, N. Y. (*Hardy plants.*)

Emerson, Prof. R. H., Horticulturist, Neb. Exp. Sta., Lincoln, Neb. (*Nebraska.*)

Farnham, J. E. C., Ex-Pres. R. I. Hort. Soc., Providence, R. I. (*Rhode Island.*)

Fernald, M. L., Asst. in Gray Herbarium, Cambridge, Mass. (*Salvia.*)

Fields, John, Dir. Agr. Exp. Sta., Stillwater, Okla. (*Oklahoma.*)

Fisher, Dr. Jabez, Fruit-grower, Fitchburg, Mass. (*Massachusetts.*)

Ganong, W. F., Prof. of Botany, Smith College, Northampton, Mass. (*Cacti, and many proofs of physiological subjects.*)

Gifford, John C., Asst. Prof. of Forestry, College of Forestry, Cornell Univ., Ithaca, N. Y. (*Poinciana.*)

Goodman, L. A., Fruit-grower, Kansas City, Mo. (*Missouri.*)

Greenman, J. M., University Museum, Cambridge, Mass. (*Zinnia.*)

Halliday, Robt. J., Florist, Baltimore, Md. (*Azalea. Camellia.*)

Harris, J. S., Fruit-grower, La Crescent, Minn. (*Minnesota.*)

Hays, Willet M., Prof. of Agric., Univ. of Minn., Minneapolis, Minn. (*Plant-Breeding.*)

Heiges, S. B., Pomologist, York, Pa. (*Pennsylvania.*)

Heiss, J. B., Florist, Dayton, Ohio. (*Palms.*)

Heller, A. A., Botanist, Lancaster, Pa. (*Porto Rico.*)

Herbst, J. L., Fruit-grower, Sparta, Wis. (*Strawberry.*)

Hewson, Wm., Orchid-grower for Wm. Scott, Buffalo, N. Y. (*Odontoglossum. Oncidium.*)

Hicks, D. C., Fruit-grower, No. Clarendon, Vt. (*Vermont.*)

Hill, Robert T., U. S. Dept. Agric., Washington, D. C. (*Porto Rico.*)

Hosmer, A. W., Botanist, Concord, Mass. (*Polygala, and some other native plants.*)

Howard, A. B., Seed-grower, Belchertown, Mass. (*Verbena. Zinnia.*)

Hutt, H. L., Prof. of Horticulture, Ont. Agric. College, Guelph, Ont. (*Kale. Kohlrabi.*)

Jack, Mrs. Annie L., Chateauguay Basin, Prov. Que. (*Native Plants.*)

Jepson, Willis L., Botanical Dept., Univ. Calif., Berkeley, Calif. (*A few Californian subjects.*)

Jennings, E. B., Specialist in pansies, Southport, Conn. (*Pansy.*)

Jones, Rev. C. J. K., Los Angeles, Calif. (*Various Californian plants.*)

Jordan, W. H., Dir. N. Y. Exp. Sta., Geneva, N. Y. (*Fertility. Fertilizers.*)

Katzenstein, Otto, Manager Pinehurst Nurseries, Pinehurst, N. C. (*Stillingia.*)

Kedzie, Dr. R. C., Prof. of Chemistry, Mich. Agric. College, Agricultural College, Mich. (*Fertility. Fertilizers. Lime.*)

Kellogg, Geo. J., Pomologist, Lake Mills, Wis. (*Wisconsin.*)

Kerman, John, Market-gardener, Grimsby, Ont. (*Tomato*).

Kinney, T. L., Fruit-grower, South Hero, Vt. (*Vermont.*)

King, F. H., Div. of Soils, U. S. Dept. Agric., Washington, D. C. (*Irrigation, Mulching, etc.*)

Ladd, E. F., Prof. of Chemistry, N. D. Agric. Coll., Agricultural College, N. D. (*North Dakota.*)

Lake, D. S., Nurseryman, Shenandoah, Iowa. (*Trees on Plains.*)

Latham, A. W., Sec. Minn. Hort. Soc., Minneapolis, Minn. (*Minnesota.*)

Leib, S. F., Prune-grower, San José, Calif. (*Prune.*)

Lindley, J. Van, Nurseryman, Pomona, N. C. (*North Carolina.*)

Luke, Fred K., Gardener, Mo. Botanical Garden, St. Louis, Mo. (*South Dakota.*)

Lupton, J. M., Market-gardener, Gregory, L. I. (*Cabbage.*)

Lyon, Wm. S., Census Bureau, Washington, D. C. (*Palms.*)

MacDowell, J. A., Nurseryman, City of Mexico, Mex. (*Cacti.*)

Macfarlane, Prof. J. M., Dir. U. of P. Botanic Garden, Philadelphia, Pa. (*Hybridization. Nepenthes. Pinguicula.*)

Mackenzie, R. R., Sec. J. M. Thorburn & Co., New York, N. Y. (*Many important bulbs.*)

Makepeace, A. D., Cranberry-grower, West Barnstable, Mass. (*Cranberry.*)

Manda, W. A., Horticultural expert, South Orange, N. J. (*Orchid pictures.*)

Manning, C. H., Sheridan, Wyo. (*Wyoming.*)

Manning, Jacob W., Nurseryman, Reading, Mass. (*Dried specimens of herbaceous perennial plants.*)

Manning, Robert, Sec. Mass. Hort. Soc., Boston, Mass. (*Biographical sketches. Horticulture.*)

Maxwell Bros., Fruit-growers, Geneva, N. Y. (*Quince.*)

McDowell, Prof. R. H., Agriculturist and horticulturist, Nev. Exp. Sta., Reno, Nev. (*Nevada.*)

McTear, John, Gardener, Montecito, Calif. (*Some plants cult. in Calif.*)

Mead, Prof. Elwood, Cheyenne, Wyoming. (*Wyoming.*)

Meehan, Thos., Nurseryman, Germantown, Pa. (deceased). (*The article "Horticulture."*)

Meriam, Dr. Horatio C., Salem, Mass. (*Pæonia. Papaver.*)

Merrill, L. H., Prof. of Chemistry, Me. Agric. Coll., Orono, Me. (*Maine.*)

Miller, E. S., Specialist in Bulbs, Floral Park, L. I. (*Many articles on bulbs.*)

Miller, H. H., Paw Paw., W. Va. (*West Virginia.*)

Moon, Wm. H., Nurseryman, Morrisville, Pa. (*Pennsylvania.*)

Moorhead, James R., Grower of Cacti, Cactus Farm, Moorhead, Texas. (*Cacti.*)

Moses, Wallace R., Fruit-grower, West Palm Beach, Fla. (*Orange. Pineapple.*)

Mudge, W. S., Fruit-grower and melon raiser, Hartland, N. Y. (*Muskmelon.*)

Nanz & Neuner, Florists, seedsmen, and nurserymen, Louisville, Ky. (*Kentucky.*)

Nash, Geo. V., Gardener, N. Y. Bot. Garden, Bronx Park, N. Y. (*Genera of grasses.*)

Nickels, Miss Anna B., Grower of Cacti, Laredo, Texas. (*Certain genera of Cacti.*)

Ohmer, Nicholas, Fruit-grower, Dayton, Ohio. (*Ohio.*)

Osterhout, W. J. V., Botanical Dept., Univ. of Calif., Berkeley, Calif. (*Variegation.*)

Parsons, Samuel B., Nurseryman, Flushing, L. I. (*The articles "Horticulture" and "Pomology."*

Pendergast, W. W., Pres. Minn. Hort. Soc., Hutchinson, Minn. (*Minnesota.*)

Pennock, C. J., Florist and Gardener, Kennet Square, Pa. (*Tomato.*)

Pericat, Alphonse, Gardener, West Philadelphia, Pa. (*Læliocattleya.*)

Pierson, F. R., Nurseryman, Tarrytown-on-Hudson, N. Y. (*Bulbs.*)

Ragan, W. H., Div. of Pomology, U. S. Dept. Agric., Washington, D. C. (*Indiana.*)

Ramsay, F. T., Nurseryman, Austin, Tex. (*Texas.*)

Rea, Frederic J., Nurseryman, Norwood, Mass. (*Polemonium.*)

Rebmann, Jeremiah, Lincoln, Neb. (*Philippine Islands.*)

Richardson, E. A., Landscape gardener, Boston and Albany, 40 Austin St., Newtonville, Mass. (*Railroad Gardening.*)

Rider, Prof. A. J., Philadelphia, Pa. (*Cranberry.*)

Robinson, Prof. B. L., Curator, Gray Herbarium of Harvard Univ., Cambridge, Mass. (*Various articles on native plants.*)

Robinson, Charles Mulford, Author of "The Improvement of Towns and Cities." Rochester, N. Y. (*Village Improvement.*)

Robinson, John, Author of "Ferns in their Homes and Ours," Salem, Mass. (*Several articles on ferns.*)

Rock, John, Fruit-grower and nurseryman, Niles, Calif. (*Plum. Prune.*)

Rohnert, Waldo, Specialist in sweet peas, Sargent, Calif. (*Sweet Pea.*)

Root, A. I., Dealer in bee-keepers' supplies, Medina, Ohio. (*Tomato.*)

Ross, J. J., Fruit-grower, Seaford, Del. (*Peach.*)

Rothrock, J. T., Commissioner of Forestry, West Chester, Pa. (*Rothrockia.*)

Ryals, G. M., Market-gardener, Savannah, Ga. (*Tomato.*)

Saltford, Wm. G., Florist and specialist in violets, Poughkeepsie, N. Y. (*Violet.*)

Sander & Co., Nurserymen of St. Albans, Eng. (A. Dimmock, New York agent). (*Recent importations, particularly orchids and palms.*)

Sandiford, Robert, Specialist in pelargoniums, Mansfield, Ohio. (*Pelargonium.*)

Schneck, Jacob, Amateur botanist, Mt. Carmel, Ill. (*Vitis.*)

Schultheis, Anton, Florist, College Point, N. Y. (*Woody plants from Australia and the Cape, as Erica.*)

Scoon, C. K., Fruit-grower, Geneva, N. Y. (*Cherry.*)

Scott, Alex. B., of Robert Scott & Son, Sharon Hill, Pa. (*Rose.*)

Shady Hill Nursery Co., Boston, Mass. (*Herbaceous perennials.*)

Shaw, Thos., Prof. of Animal Husbandry, Univ. of Minn., St. Anthony Park, Minn. (*Medicago. Melilotus.*)

Shinn, J. C., Fruit-grower, Niles, Calif. (*Pear.*)

Sievers, John H., Specialist in pelargoniums, San Francisco, Calif. (*Pelargonium.*)

Simpson, J. H., Botanist, Braidentown, Fla. (*Vitis, Zamia and some Florida subjects.*)

Slaymaker, A. W., Fruit-grower, Camden, Del. (*Delaware.*)

Small, John K., N. Y. Botanical Garden, Bronx Park, N. Y. (*Polygonum.*)

Smith, Archibald, Manager Joseph Breck & Sons Corporation, Boston, Mass. (*Seeds.*)

Stewart, W. J., Sec. Soc. American Florists, Boston, Mass. (*Syringa.*)

Soltau, Chris, Grower of pansy seed, Jersey City, N. J. (*Pansy.*)

Stanton, Geo., Ginseng specialist, Apulia Station, N. Y. (*Ginseng.*)

Stockbridge, Prof. H. E., Dir. Fla. Exp. Sta., Lake City, Fla. (*Tomato.*)

Storrs & Harrison, Nurserymen, Painesville, Ohio. (*Various plants.*)

Sturtevant, Edmund D., Specialist in aquatics, Station E., Los Angeles, Calif. (*Victoria and other aquatics.*)

Suzuki & Iida, Yokohama Nursery Co., New York, N. Y. (*Japanese plants.*)

Thompson, Mrs. J. S. R., Spartanburg, S. C. (*Perfumery Gardening.*)

Thurlow, T. C., Nurseryman and specialist in peonies, West Newbury, Mass. (*Pæonia.*)

Todd, Frederick G., Landscape Architect. Montreal, P. Q. (*Hardy trees and shrubs.*)

Troth, Henry, Photographer of plants and landscapes, Philadelphia, Pa. (*Photography.*)

Vick's Sons, James, Seedsmen, Rochester, N. Y. (*Various plants.*)

Watson, H. D., Farmer and fruit-grower, Kearney, Neb. (*Trees for the Plains.*)

Webb, Prof. **Wesley**, Dover, Del. (*Delaware.*)

Wedge, Clarence, Fruit-grower, Albert Lea, Minn. (*Minnesota.*)

Whilldin Pottery Co., Philadelphia, Pa. (*Pots.*)

White, J. J., Cranberry-grower, New Lisbon. N. J. (*Cranberry.*)

Willard, S. D., Nurseryman, Geneva, N. Y. (*Important fruits, as Cherry.*)

Wittbold Co., The Geo., Florists, Chicago, Ill. (*Palms and ferns. Nephrolepis Wittboldi.*)

Young, B. M., Specialist in nut culture, Morgan City, La. (*Pecan.*)

ABBREVIATIONS

I. OF GENERAL EXPRESSIONS

cult.	cultivated, etc.
diam.	diameter
E.	east.
ft.	feet.
in.	inches
N.	north.
S.	south.
trop.	tropics, tropical.
W.	west.

II. OF BOTANICAL TERMS

fl.	flower.
fls.	flowers.
fld.	flowered.
fr.	fruit.
h.	height.
lf.	leaf.
lft.	leaflet.
lvs.	leaves.
st.	stem.
sts.	stems.
syn.	synonym.
var.	variety.

III. OF BOOKS AND PERIODICALS

To aid the student in the verification of the work, and to introduce him to the literature of the various subjects, citations are made to the portraits of plants in the leading periodicals to which the American is most likely to have access. These references to pictures have been verified as far as possible, both in the MS. and in the proof. A uniform method of citation is much to be desired, but is extremely difficult, because periodicals rarely agree in methods. With great reluctance it was decided to omit the year in most cases, because of the pressure for space, but the student who lacks access to the original volumes may generally ascertain the year by consulting the bibliographical notes below.

An arbitrary and brief method of citation has been chosen. At the outset it seemed best to indicate whether the cited picture is colored or not. This accounts for the two ways of citing certain publications containing both kinds of pictures, as The Garden, Revue Horticole, and Gartenflora. The figures given below explain the method of citation, and incidentally give some hints as to the number of volumes to date, and of the number of pages or plates in one of the latest volumes.

A few works of the greatest importance are mentioned elsewhere by way of acknowledgment (p. xv). The standard works on the bibliography of botany are Pritzel's Thesaurus and Jackson's Guide to the Literature of Botany; also, Jackson's Catalogue of the Library of the Royal Botanic Gardens, Kew.

A.F.	The American Florist. Chicago. A trade paper founded August 15, 1885. The volumes end with July. Many pictures repeated in "Gng." (14:1524=vol. and page.)
A.G.	American Gardening. New York. Represents 14 extinct horticultural periodicals, including The American Garden (1888–1890). Founded 1879(?) (20:896=vol. and page.)
B.	The Botanist. Edited by Maund. No years on title pages. Founded 1839. 8 vols., 50 colored plates in each vol. (8:400=vol. and col. plate.) Cumulative index.
B.B.	Britton & Brown. An illustrated Flora of the Northern U. S., etc. New York. 1896–1898. (3:588=vol. and page.)
B.F.	See F.
B.H.	La Belgique Horticole. Ghent. 35 vols. (1851–1885.)
B.M.	Curtis' Botanical Magazine. London. Founded 1787. The oldest current periodical devoted to garden plants. The vol. for 1899 is vol. 125 of the whole work. Index to first 107 volumes by E. Tonks. London. (7690=col. plate.)
B.R.	Botanical Register (1815–1847). Vols. 1–14 edited by Edwards: vols. 15–33 by Lindley. In vols. 1–23 the plates are numbered from 1–2014. In vols. 24–33 they are numbered independently in each vol. There are 688 plates in vols. 24–33. "An Appendix to the First Twenty-three Volumes" (bound separately or with the 25th vol.) contains an index to the first 23 vols. An index to vols. 24–31 may be found in vol. 31. (33:70=vol. and col. plate.)
D.	Dana. How to Know the Wild Flowers. New York. 1893. (298=page.)
Em.	Emerson, G. B. Trees and Shrubs of Massachusetts. Boston. 2 vols. 149 plates.
F.	The Florist. London. 1840–1884. (1884:192=year and page pp. col. plate.) Editors and title pages changed many times. Known as the Florist, Florist's Journal and Florist and Pomologist. Sometimes improperly called British Florist.
F.C.	Floral Cabinet. Knowles & Westcott. London. 1837–1840. (3:137 vol. and col. plate).

F.E.	The Florists' Exchange. New York. A trade paper, whose pictures sometimes are repeated in "A.G." Founded Dec. 8, 1888. (11:1298=vol. and page.)
F.J.	See F.
F.M.	Floral Magazine. London. Series I. 1861–1871, 8vo. Series II. 1872–1881, 4to. (1881:450=year and col. plate.)
F.P.	See F.
F.R.	Florists' Review. Chicago. A trade paper. Vol. 1, Dec. 2, 1897, to May 26, 1898. Two vols. a year. (4:660=vol. and page.)
F. S.	Flore des Serres. Ghent. (1845–1880.) Inconsistent in numbering, but the plate numbers are always found on the plate itself or on the page opposite. Valuable but perplexing indexes in vols. 15 and 19. (23:2481=vol. and col. plate.)
G. C.	The Gardeners' Chronicle. London. Series I. (1841–1873) is cited by year and page. Series II. or "New Series" (1874–1886), is cited thus: II. 26:824=series, volume and page. Series III. is cited thus: III. 26:416. Two vols. a year, beginning 1874. A select index is scattered through 1879 and 1880. Consult II. 12:viii (1879), and similar places in subsequent vols.
G. F.	Garden and Forest. New York. 1888–1897. (10:518=vol. and page.)
G.M.	Gardeners' Magazine. London. Ed. by Shirley Hibberd. Founded 1860. Vols. 31–42 are cited. (42:872=vol. and page.)
Gn.	The Garden. London. Founded 1871. Two vols. a year. (56:1254=vol. and col. plate. 56, p. 458=vol. and page containing black figure.) An Index of the first 20 vols. was separately published. Complete Index of Colored Plates to end of 1897 in vol. 54, p. 334.
Gng.	Gardening. Chicago. Founded Sept. 15, 1892. Vols. end Sept. 1. (7:384=vol. and page.)
Gt.	Gartenflora. Berlin. Founded 1852. (Gt. 48:1470=vol. and col. plate. Gt. 48, p. 670=vol. and page containing black figure.)
G.W.F.	Goodale's Wild Flowers of America. Boston, 1886. (50=col. plate.)
HBK.	Humboldt, Bonpland & Kunth. Nova Genera et Species, etc. Paris. 1815–25. 7 vols. Folio.
I. H.	L'Illustration Horticole. Ghent. (1854–1896.) (43:72=vol. and col. plate.) The volumes were numbered continuously, but there were 6 series. Series I.=1854–63. Series II.=1864–69. Series III.=1870–80. Series IV. = 1881–86. Series V. = 1887–93. Series VI. =1894–96. The plates were numbered continuously in the first 16 vols. from 1 to 614: in vols. 17–33 they run from 1 to 619: in series V. from 1 to 190: in Series VI. they begin anew with each vol. Valuable indexes in vols. 10 and 20. Series V. in 4to, the rest 8vo.
J.H.	Journal of Horticulture. London. Founded in 1848 as The Cottage Gardener. Series III. only is cited, beginning 1880. (III. 39:504=series, vol., page.)
K.W.	See F. C.
L.	In vol. 1 of this work, sometimes means Lindenia, sometimes Lowe's Beautiful Leaved Plants. See "Lind." and "Lowe."
L.B.C.	The Botanical Cabinet. Loddiges. 1817–33. 100 plates in each vol. Complete index in last vol. (20:2000=vol. and col. plate.)
Lind.	Lindenia, Ghent. Founded 1885. Folio. Devoted to orchids.
Lowe	Beautiful Leaved Plants. E. J. Lowe and Howard. London. 1864. (60=col. plate.)
M.	A. B. Freeman-Mitford. The Bamboo Garden. London. 1896. (224=page.)
M.D.G.	Möller's Deutsche Gärtner-Zeitung. Erfurt. Founded 1886. (1897:425=year and page.)
Mn.	Meehan's Monthly. Germantown, Philadelphia. Founded 1891. (9:192 = vol. and page opposite col. plate.)
N.	Nicholson. Dictionary of Gardening. Vols. 1–4 (1884–1887). Vol. 5 in preparation.
P.F.G.	Lindley & Paxton. Flower Garden. London. 1851–53. 3 vols. 4to.
P.G.	Popular Gardening. Buffalo. 1885–90. (5:270=vol. and page.)
P.M.	Paxton's Magazine of Botany. London. 1834–49. (16:376 = vol. and page opposite col. plate.) Vol. 15 has index of first 15 vols.
R.	Reichenbachia. Ed. by Fred. Sander. London. Founded 1886. Folio.
R.B.	Revue de l'Horticulture Belge et Etrangère Ghent. Founded 1875 ? (23:288=vol. and page opposite col. plate.) In the first vol. of the CYCLOPEDIA "R.B." sometimes means Belgique Horticole, but the confusion is corrected in later vols., where Belgique Horticole is abbreviated to "B.H."
R.H.	Revue Horticole. Dates from 1826, but is now considered to have been founded in 1829. (1899:596=year and page opposite col. plate. 1899, p. 596=year and page opposite black figure.)
S.	Schneider. The Book of Choice Ferns. London. In 3 vols. Vol. 1, 1892. Vol. 2, 1893.
S.B.F.G.	Sweet British Flower Garden. London. Series I., 1823–29, 3 vols. Series II., 1831–38, 4 vols.
S.H.	Semaine Horticole. Ghent. Founded 1897. (3:548=year and page.)
S.M.	Semaine Horticole. Erroneously cited in this fashion a few times in first vol.
S.S.	Sargent. The Silva of North America. 13 vols. Vol. 1, 1891. Vol. 12, 1898. (12:620=vol. and plate, not colored.)
S.Z.	Siebold & Zuccarini. Flora Japonica. Vol. 1, 1835–44. Vol. 2 by Miquel, 1870. (2:150=vol. and plate.)
V. or V. M.	Vick's Magazine. Rochester, N. Y. Founded 1878. Vols. numbered continuously through the 3 series. Vols. begin with Nov. (23:250=vol. and page.) Sometimes cited as "Vick."

⁂ *Additional abbreviations and explanations will be found in the introductory pages of Vol. I.*

Cyclopedia of American Horticulture

RADISH (*Raphanus sativus*). Plate XXXI. The Radish is one of the most popular of garden vegetables. It is of quick growth, and the product is secured at the time of the year when fresh vegetables are in demand. In order that Radishes may be of the best quality, they should have made a rapid growth. The soil should be rich, light and loose,—one that drains readily and does not bake with heavy rains. Radishes fit for the table may be had in three to six weeks from the sowing, depending on the variety and the "quickness" of the soil. They are often grown as a catch-crop with other vegetables. They may be sown in the rows with early beets, peas or other crops, and they are usually mature enough for use before they seriously interfere with the main crop. Sometimes seeds of Radishes are sown in the rows of slow-germinating things, like carrots and parsnips, in order that the seedlings may mark the row and thereby facilitate tillage. Many of the Radishes may be allowed to remain long enough to produce an edible tuber. Aside from the root-maggot, the Radish is relatively free from insects and diseases. When the root-maggot appears in any place, it is usually best to discontinue the growing of Radishes in that area for two or three years, until the insects have been starved out. The maggots may be killed by an injection of bisulfide of carbon into the earth about the plants; but this is usually more expense than the product is worth. Early Radishes may be grown in hotbeds or coldframes with the greatest ease, and in these places they are usually less subject to the attacks of the cabbage maggot, since the crop is matured in advance of the maggot season.

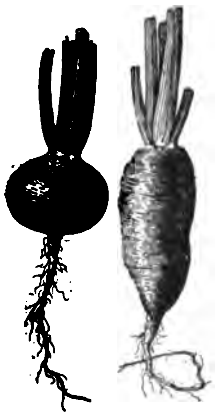
Radishes are readily forced in the winter months. It is necessary that the house be light. The soil should be a sandy loam, free from silt and clay. It is best to grow Radishes in solid beds rather than on benches. They thrive best in a low temperature. The temperature during the day should not exceed 65° to 75° in the shade, and at night it may drop to 45° to 50°. If the temperature is too high, and particularly if the plants are given bottom heat, the plants tend to run to top rather than to root. The seed is usually sown in rows from 5–8 inches apart, and they are thinned in the row until they stand 2 or 3 inches apart. In order that the crop shall be uniform and mature simultaneously, it is advisable either to sift the seed or to transplant the young Radishes. Galloway has found by experiment that Radish seeds two-twenty-fifths of an inch in diameter are too small to give a satisfactory and uniform crop. He therefore advises that seeds be run through sieves with a mesh of that diameter in order to separate the small specimens. In a certain experiment, he secured from two pounds of commercial seed 19½ ounces of large seed, 10⅔ ounces small seed, the remainder being bits of gravel, sticks and other impurities. The chief value of this sorting lies in the greater uniformity of the crop. Almost every plant can then be relied upon to reach maturity. It is the practice in some houses to transplant the young Radishes. The seed may be sown in flats or in beds at one end of the house, and when the Radishes have made two or three leaves, they are transplanted into permanent quarters. In this operation, all the small and weak plants are discarded and the crop is therefore more uniform. It is supposed by some growers, also, that the breaking of the tap-root in the process of transplanting tends to make the tuber shorter and thicker and to induce an earlier maturity. By means of transplanting, the use of the house may be economized. Whilst one crop is growing, another may be started in a seed-bed or in flats. As soon as the first crop is removed, the ground may be thoroughly raked, fertilized, and the new plants put in. In some cases the new crop is transplanted between the rows of the old crop a few days before the latter is removed; but, unless the soil is rich and in good condition, it is better to wait until the crop is removed in order that the land may be thoroughly fitted for the new plants. Radishes are often forced in connection with lettuce, and they thrive well in the same temperature. The varieties most used for forcing, as also for the early spring crop in the garden, are the globular or half-long kinds. With these varieties, a depth of soil of 4 inches is sufficient for good results.

2060. Long Scarlet Radish (× ⅓).

2061. A dainty bunch of Radishes (× ⅓).

The Radish is variable in size, shape, color and consistency of root and in season of maturity. Varieties may be classified as spring, summer and winter Radishes; or as globular, half-long and long Radishes; or as red, white, gray and black Radishes. Figs. 2060–2062 show some of the forms.

The origin and nativity of the Radish are questions of dispute. For geographical reasons, it is supposed that the Radish is wild in temperate Asia, probably in the oriental part, although truly indigenous Radishes are not yet known. Not infrequently the Radish runs wild about gardens, and in that case the root soon deteriorates into a small, slender, woody and more or less fibrous member. It has been thought by some that the Radish is only a modified form of the wild charlock, or *Raphanus Raphanistrum*. In fact, experiments were made on the charlock by Carrière, who was able in a few years to produce edible Radishes from the wild plant. While these investigations seem to be conclusive that the Radish can be produced from the charlock, they nevertheless do not prove that such was the actual origin of the garden Radish. DeCandolle, whilst accepting Carrière's experiments, was unable to understand how the Radishes of India, China and Japan could have originated from the charlock, since that plant is unknown in those countries and the Radish has been grown there for centuries. It is possible that the Radish was carried eastward from western Asia and Europe, but such has not been the general course of the migration of plants. It is possible that the Radishes of the Orient are a different species from those in Europe, although they are generally regarded as the same species. See *Raphanus*.



2062. French Breakfast and Olive-shaped Radishes, two of the early or spring Radish class (× ½).

The experiments of E. A. Carrière with the wild Radish (Journ. d'Agric. Prat., 1869, also separately printed) form a classical example of the possibilities of plant-breeding. In five years by means of cultivation and selection alone he was able to produce from a troublesome weed practically all the important type-forms of Radish in cultivation. Carrière began by gathering seeds of the wild *Raphanus Raphanistrum* (Fig. 2063), which he collected as far as possible away from all cultivated plants of the same family. Duplicate sowings were made in light, dry soil at Paris and in strong clay soil in the country. The roots at Paris were mostly white or rose and the long form dominated; in the country all the colors and all possible forms were obtained. The roots of the wild plant were very slender, dry, fibrous, always the same shape, always white, hard, woody and inedible. The roots of the same species after four generations of seed were large, various in form and color, fleshy, the flesh white, yellowish, rosy or violet, succulent, and good to eat. Figs. 2064, 2065.

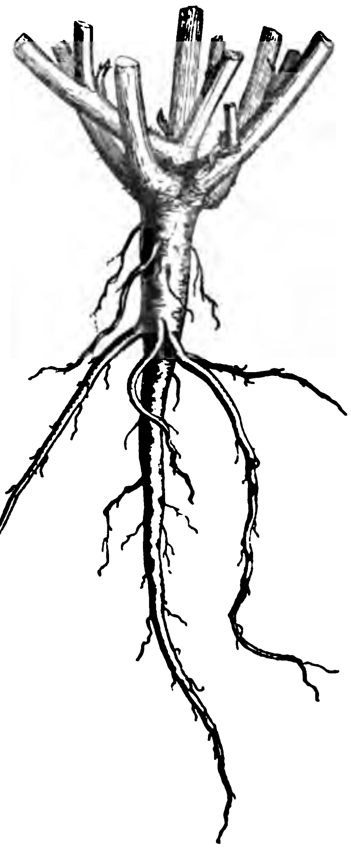
Carrière gives three pictures of the wild type with which he began, and eight pictures of various types produced after five years of intelligent cultivation and selection. The original root was about 7 inches long, but it was half an inch thick for a distance of barely an inch and a half. Taking extreme cases, the length of root was increased from 1½–10 inches, the thickness from ½–5 inches, the weight from 22 to 651 grams. In terms of percentage the length was increased 666 per cent, the thickness 1,000 per cent, the weight 338 per cent. Among the forms pictured by Carrière were the common long, the carrot shape, the turnip shape, the beet shape and others,—in all 8 types, the length and diameter of which are given in every instance. All these roots had the characteristic flavor of the Radish well developed. There were others which in flavor approached turnips and other root crops of the mustard family.

The Rat-tail Radish, Fig. 2066, is grown for its much-developed soft pods, which may be used as Radishes are and in the making of pickles. It is rarely grown in American gardens, although it is well worth raising as a curiosity. It is annual, and its cultivation presents no difficulties. L. H. B.

Garden Notes on Radish.—A very small area will furnish an abundance of Radishes for a family. Radishes are of easy culture, and as they are at their best when not more than an hour out of the ground they make one of the most desirable vegetables for the home garden. In order to secure high quality it is essential to use well-bred seed, secure a quick growth, and use the product when in prime condition.

Spring Radishes.—The earlier quick-growing sorts will reach a usable size in 20–40 days from planting, and become pithy and worthless within 10–12 days later. Therefore repeated sowings are necessary to insure a continuous supply. The plant is very hardy, and the first sowing should be made as soon as the ground can be worked. The richer and more friable the soil can be made the better, and there is little danger of over-manuring provided that the manure is fine; and the older and better decomposed it is the more satisfactory will be the results. Having mixed the fertilizer with the soil and made it as fine and smooth as possible, form drills about 1 in. deep and 10–18 in. apart, and drop 15–30 seeds to the foot, covering with about ½ in. of soil well firmed down with the hand or hoe. From 2 to 4 feet of drill will furnish an abundant supply for one person during the time those from a single sowing are usable, and sowings should be repeated once in 10 or 12 days.

Early Radishes are often ruined by "maggots." We know of no certain preventive other than covering the soil just after planting with a heavy dressing of unleached wood ashes. A still thicker dressing of tobacco dust will often enable one to get good roots when otherwise the crop would be a failure. Market-gardeners often scatter a few seeds of early Radish in their rows of onions and beets. The Radishes start quickly and enable the gardener to see and cultivate the rows sooner; and the Radish crop is matured and pulled before the space is all needed for the more permanent crops.



2063. Root of the wild Radish, with which Carrière began his experiments (× ½).

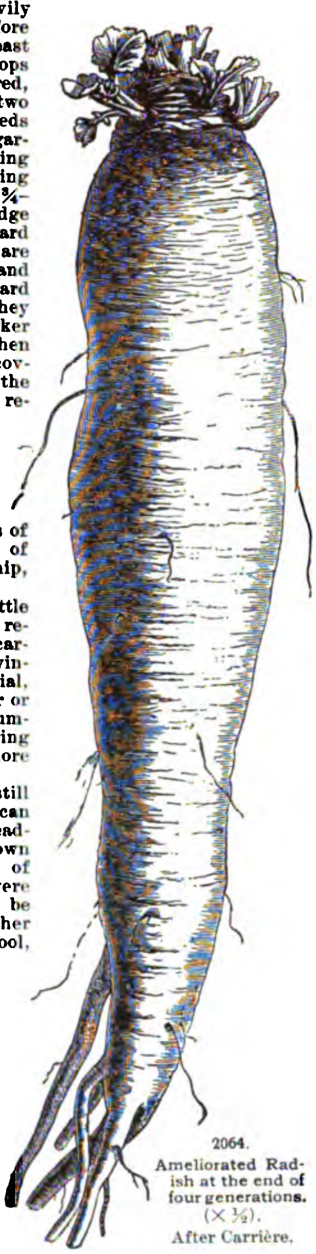
Petite Cote, Ontario, is a little hamlet of French settlers on the Detroit river, in which nearly every cottage has a Radish garden, ranging from a few rods to an acre. On the product of these gardens the owners depend for a large share of their income. The soil is rich, black, sandy and alluvial with permanent water at a depth of 6 ft. or less, though the surface is by no means wet or marshy. The gardens are heavily manured, not only in the spring but before each crop is started. They make at least two, and sometimes as many as five crops during the season. The beds are manured, spaded and replanted within a day or two after the roots have been pulled. Weeds are never seen in a Petite Cote Radish garden. The only tools used are a spading fork, a steel rake, a marker (made by fixing a row of pegs ⅛-½ in. in diameter and ¾-1½ in. long, 1 in. apart in the rounded edge of a narrow board), and a standing board 8-12 in. wide and as long as the beds are wide. Having made the soil as fine and smooth as possible, they lay the board across the bed and, standing on it, they make a row of holes by pressing the marker into the soil along its inner edge. They then drop one or two seeds into each hole, covering them with soil with the edge of the standing board as they turn it over and repeat the process. Only a small part of the garden is planted at once, but sowings are made once or twice a week throughout the season, so that there is a constant succession of roots in prime condition. The variety used is the Long Scarlet. There is a large list of varieties of these spring or forcing Radishes, all of them tracing back to the Scarlet Turnip, Scarlet Half-Long or Long Scarlet type.

Summer Radishes. — These are a little slower in growth than the preceding but remain longer in condition. The Long Scarlet type appears in both summer and winter Radishes, but the Chartier, Celestial, Stuttgart, etc., are used only for summer or late fall supply. The culture of the summer sorts is the same as that of the spring sorts, except that they should be given more room.

Winter Radishes. — These are of still slower growth and firmer flesh and can be held in good condition almost as readily as turnips. The seed may be sown from the last of July till the middle of September, and at the approach of severe freezing weather the roots should be gathered, packed in sandy soil and either buried out of doors or stored in a cool, damp cellar, where they will remain in good condition all winter.

Seed-Growing.—In growing seed the summer sorts are treated as annuals. The seeds are sown in early spring, and as soon as the plants reach usable size they are taken up, topped, carefully sorted and the best ones reset, whereupon they will speedily take root and throw up seed-stalks. Sometimes seed is grown without transplanting the roots, but as there can be no selection nor even rogueing, the seed so grown is necessarily unreliable. The seed requires a long time to mature, and is not thoroughly ripe until long after the pods have turned brown, and growers are in the habit of cutting and partially drying the stalks and allowing them to stand in the stack or mow for some time before threshing. The later sorts are treated as biennials, the roots being stored during the winter. Most of the Radish seed used in this country is imported, though there is no reason, unless it be the question of cheap labor, to prevent its being grown to advantage here.

W. W. Tracy.



2064. Ameliorated Radish at the end of four generations. (× ½). After Carrière.

RAFFIA is the Malagasy name of a palm which furnishes a staple article of commerce called raffia fiber. It is indigenous to Madagascar, where it grows without cultivation or attention of any kind. One palm leaf, or frond, produces 80-100 long green divisions 2-5 ft. in length, like the leaves of the sugar cane, but of a dark lustrous green color and thicker and stiffer. The under part of this green leaf is of a pale greenish yellow color, and from that side the inner skin is peeled off in the same manner as the skin on the outside of a pea pod, except that it peels off straight to the tip without breaking. It is then of the palest green, and after being dried in the sun assumes a light straw color. This is the raffia fiber of commerce.

Raffia fiber is extensively used by the natives for making cloths called silk lambas and rebannas, which bring fancy prices in Europe and America, where it is used in the manufacture of various kinds of hats, etc. A large trade is also done in raffia fiber in Europe for use in the manufacture of fancy baskets, but in America, while raffia fiber has been used to a limited extent in the manufacture of hats, its principal use is for tying vines, flowers, asparagus and celery bunches and for grafting. It is soft as silk and not affected by moisture or change in temperature so as to risk cutting or wounding the most delicate tissues, and it does not break or ravel when folded or knotted. These qualities bring it into general use in Europe, especially in the vineyards of France, where it is extensively used, and consequently maintain its price. It is virtually inexhaustible in Madagascar, the supply being limited only by the scarcity of labor. For export, the fiber is collected in large skeins, twisted or plaited, and then packed in compressed bales of about 100 kilograms (220 lbs.) each. About 20,000 bales are exported annually.

Chas. W. Jacob & Allison.

RAGGED LADY. *Nigella Damascena.*

RAGGED ROBIN. *Lychnis Flos-cuculi.*

RAG GOURD. *Luffa.*

UNIV.

RAILROAD GARDENING. Plate XXXII. This expression usually refers to the formal use of flower beds about railroad stations. Such work is ornamental gardening, not landscape gardening, the latter being the art of arranging plants so as to make nature-like pictures. Most of the so-called landscape gardening that is done at railroad stations is really ornamental gardening. Carpet beds are relatively costly as compared with hardy shrubbery. They last but a few months and then leave bareness, while the best hardy trees and shrubs skilfully arranged are interesting all the year round. This making of nature-like pictures with relatively simple, inexpensive and permanent materials is a much higher art than that involved in creating and maintaining formal flower beds. However, both things have their places. Many a tired traveler is cheered by the bright colors of a neatly kept railroad station. Such displays are suitable at the stations if anywhere along the line. They are always preferable to dirt, ugliness and a general air of indifference.

It may be well to begin an account of railroad gardening with an historical sketch.

The Movement in England.—Planting has been done on the station-grounds of some English railways for many years, but it is almost exclusively limited to purely ornamental gardening. The corporations do little beyond offering prizes to station-masters and their assistants. This system has been in operation for about twenty-five years on the Great Eastern, since 1885 on the Midland, and for a shorter time on the Great Western railway. The prizes range from 5s. to £5, and in 1900 aggregated £300 on the Midland railway. The little planting that is done by the railway companies themselves is confined to a few trees of low growth near stations, to a background of shrubs for some of the so-called "platform gardens," and to sowing broom and gorse on certain slopes of the permanent way between stations. The "allotment gardens" that attract attention on English roads are small tracts near stations that are rented to employees of the roads, who use them as vegetable, fruit, and, to some extent, as flower gardens. The Railway Banks Floral Association is a new and interesting factor in the improvement of English railway rights of way. Lord Grey was the originator of the novel and excellent scheme. The society is an organization for interesting owners of adjacent property, and for collecting money and materials for sowing and planting railway "banks" (downward slopes) and "cuttings" (upward slopes) of the permanent way, to the end of making them more attractive. The results have been eminently satisfactory.

2065. Ameliorated Radishes, fourth generation (X ½). After Carrière. (See Radish, page 1488.)

Denmark's Progress.—In Denmark the railways belong almost without exception to the government, and improvements are begun when the roads are constructed. These consist of five classes of work: (1) planting of station-grounds; (2) hedges as a substitute for fences; (3) snow shelters; (4) vegetation on embankments as a protection against erosion; (5) allotment gardens near block signal stations. Planting on station-grounds is purely for esthetic purposes; the other features, while possessing some attractions, are maintained chiefly for their economic advantages. The materials for planting are obtained from nurseries ("planteskoler") owned by the roads and consist for the most part of shrubs, largely coniferous. These nurseries, as well as the entire planting, are under the supervision of a "plantoer," i.e., a chief botanical instructor. The allotment gardens, like their English namesakes, are tracts near the block signal stations where railway employees conduct vegetable and fruit gardens for their own use, and sometimes care for a few flowering plants.

Conditions in Sweden.—Ornamental planting has been universal on government railways, as well as on the majority of private railways in Sweden since 1862. According to the Royal Administration of the Swedish State Railways, the following distinctions are made: (1) decorative and fire protective plantings on station-grounds; (2) mixed plantings (decorative and economic) on "habitation grounds"; (3) plantings along the railway lines as hedges or for protection against snow. Station planting consists of trees selected to suit the climate of various parts of the country, of shrubs, and of perennials and annuals (flowering as well as bedding plants). At the largest stations (only about 75) annuals are exclusively used for "modern or elegant combinations." The planting at habitation grounds consists of fruit trees, small fruits, a few ornamental shrubs, some flowering plants, and a small kitchen-garden. The state railways yearly plant out about 40,000 hard-wooded plants (trees and shrubs), and 400,000 soft-wooded plants (perennials and annuals), which are nearly all grown at five greenhouses, hotbeds and nurseries situated in different parts of the country. About 20,000 fruit trees and 500,000 gooseberries and currants are at present planted out on the habitation grounds. On private railways the same scheme is followed on a smaller scale. (See G.F. 2:36 for further facts regarding railway planting in Sweden.)

In various other countries there are scattered instances of ornamental, economic and protective planting on railways, including the cultivation of fruits along the rights of way of certain railways of Germany and of France.

The Canadian Pacific Railway Company has planted a considerable part of its right of way to tamarack and other suitable trees to supply the tie material of the future.

The director of the association called Het National Belang, at Utrecht, says that the association has contracts with the State Railway Company and the Holland Railway to plant the dykes of their roads. Different kinds of willows, low apple and pear trees (halfstam appel en peerenbloomen) and wild prune trees are used, the fruit of the last being "used for jams."

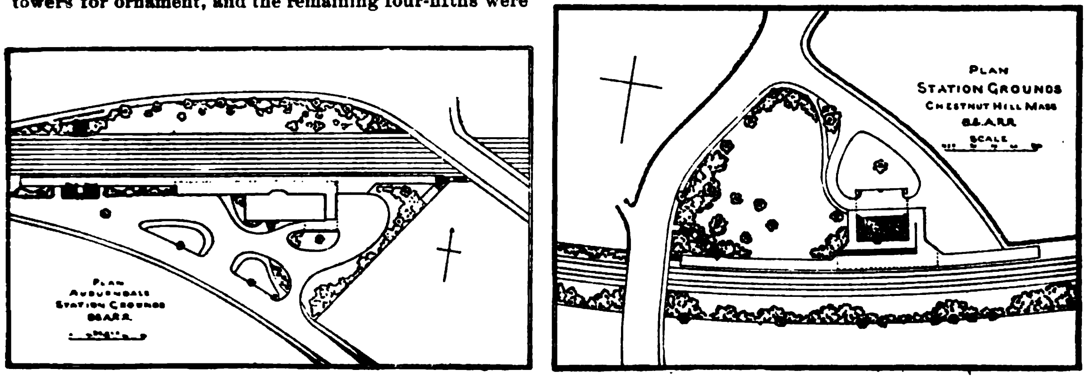
The common quince is used to a limited extent in Uruguay for binding earth on embankments, and the Paradise tree for shading station platforms. "The Ombu is the national tree of Uruguay,—useless as fuel or as timber, useless as food, but as welcome as Jonah's gourd at midday at certain seasons."

The Royal Railway Department of Siam reports through M. Kloke, acting Director General of Railways, that efforts have formerly been made to establish protective Tamarind hedges along embankments in the Korat section, which were destroyed by cattle; Eucalyptus trees grown from seed received from Australia have developed quickly into "stately trees"; and good success has also resulted from the introduction of a tree from Manila which is said to "strongly resemble the cherry

2066.
Rat-tailed Radish (X ⅙).
Grown for its enormous pods.
(See Radish, page 1488.)

tree, and is well suited for making shady alleys"; and that India rubber trees are used at smaller stations.

Remarkable work has been done in Algiers. The director of the P. L. M. Railroad Company writes that about 525,000 trees have been planted between 1869 and 1875, of which 495,000 were forest trees and 30,000 fruit trees. The prevailing forest trees are eucalypts and locusts; others are mulberry, plane, pine, cypress, willow, poplar, oak, sycamore, mimosa. About one-fifth of the forest trees were planted about stations and watch-towers for ornament, and the remaining four-fifths were used in protective plantings. The fruit trees include mandarin, orange, lemon, medlars from Japan, pomegranate, apricot and almond. This information comes through Daniel S. Kidder, U. S. Consul at Algiers.


PLAN AUBURNDALE STATION GROUNDS B&A.R.R.
SCALE
PLAN STATION GROUNDS CHESTNUT HILL MASS B&A.R.R.
SCALE

2067. Plans of Railroad Gardening.

On the left, Auburndale Station, Boston & Albany R. R. The plan provides for a porte cochere, driveways, steps to an overhead bridge and to an underground passage.
On the right, Chestnut Hill Station, Mass. Both reproduced from "Garden and Forest."

In Mexico some companies, notably the Mexican Central, maintain flower gardens and parks at larger stations.

Railroad Gardening in the United States.—The first traceable indications of the approach of the movement in this country date back to about 1870. It was not until several years later that infrequent allusions to the work crept into print. From the year 1880, however, the movement gained in favor so rapidly that the late W. A. Stiles said of it in Garden and Forest, Mar. 13, 1889: "Railroad gardening has come to be considered a necessary part of construction and maintenance among prosperous and progressive companies seeking to develop local passenger business."

Leading Spirits.—As nearly as can be determined with certainty, the first railroad garden made in this country occupied the triangular plot of ground formed by the main line and the "Y" of the Baltimore & Ohio railway, at Relay Station, where the through line from Washington joins the main line from Baltimore to the west. Frank Bramhall, of the passenger department of the Michigan Central R. R., says of this plot: "I first saw it just before the Civil War." "Harper's Magazine" for April, 1857, gives a wood-cut of this station and its surroundings, but makes no mention of the planting.

The first example of gardening known to have been made by official order, as far as can be learned, was to be seen in 1869, on the line of the Central railroad of New Jersey, on the stretch between Elizabeth and Bound Brook. The credit for this was directly due to the late president of the railroad, J. T. Johnston. That gentleman was therefore one of the pioneers, if not actually the first American railway official to recognize the advantages, and to encourage the development of such improvement of station-grounds.

Another early example, also on the Baltimore & Ohio road, is a little flower garden which has been maintained for fifteen years or more at Buckhorn Point, on a narrow strip of ground between the tracks and the edge of a precipitous height overlooking the valley of the Cheat river.

In 1880, the Boston & Albany Company built a new station at Newtonville, Mass., and a baggage-master (name unknown) who took charge at that point in 1881 evinced an interest in the care of the grounds that attracted the favorable attention of the assistant engineer, who sent him men and material for grading and sodding. This so encouraged the baggage-master that he solicited the townspeople for money to buy seeds and plants, and with such success that he maintained for three years a flower garden that favorably impressed the higher officials of the road, and led to the establishment of similar gardens at other points, and eventually to the adoption of a system of planting which has, under intelligent, artistic supervision, been radically changed in style till it now stands as the nearest approach to a comprehensive and consistent example of railroad gardening known in this or in any other country.

Among the first railway companies to improve their station-grounds by planting were the Central of New Jersey (1869), the Baltimore & Ohio (date uncertain), the Boston & Albany (1880), the New York Central & Hudson River (1880), the Erie (1881), the Southern Pacific (1885), the Pennsylvania (1886), and the Austin & Northwestern of Texas (1887).

Summary of Present Condition.—At the present time one or two of the pioneer roads in this work have abandoned it, while others have greatly increased its extent and improved its style, and many new ones have taken it up. Prominent among the latter are the Michigan Central, the Chicago & Northwestern, the Illinois Central, the Delaware & Hudson, the Philadelphia & Reading, the Lake Shore & Michigan Southern, the Chicago, Burlington & Quincy, the Atchison, Topeka & Santa Fé with its San Francisco & San Joaquin Valley line, the Cleveland, Cincinnati, Chicago & St. Louis, the Boston & Maine, the Long Island, the Union Pacific, and the Northern Pacific railroads, all of which have planted more or less tender material, with the use of an increasing proportion of permanent planting. A number of others have reserved plots for future improvement, and some have turfed such spaces. Several prominent companies do no direct planting, but seek to secure the embellishment of station-grounds by offering annual prizes to certain employees. This plan has proved fairly satisfactory and should become far more so under a uniform, well-defined system of improvement and with competent supervision.

The planting so far done consists largely of strictly ornamental gardening, that is, of formal grouping, carpet-bedding, and of similar planting composed of tender material, but it is encouraging to note evidences of growing dissatisfaction with this ephemeral style of horticultural improvement. The most brilliant and progressive railroad men are quick to recognize its limitations and defects, once their attention is directed to the matter, and, seeing its radically ineffectual results, to look for something better. Examples of increasing knowledge in this direction are seen in the action of various companies that are even now turning from the inartistic and fleeting summer show of perishable material. For instance, the New York Central & Hudson River Railway Company reports: "Heretofore the planting has consisted largely of bedding plants. Since the towns and villages have now reached a stage where their commercial importance can be determined with some degree of accuracy, and permanent facilities provided in the way of side-tracks, freight and passenger stations, we have adopted a liberal policy towards the permanent improvement of station-grounds with ornamental trees, shrubs and vines instead of annuals."

So with the Michigan Central road; the extensive summer bedding that has been made a feature at certain stations is being limited to those points, while permanent planting is used for any additional grounds that are improved. Similarly the Boston & Maine, the Philadelphia & Reading, the Pennsylvania, the Lake Shore & Michigan Southern and several others are constantly increasing the amount of hardy material used, while an official of the Chicago & Northwestern says: "The tendency on our line is to replace flower beds with hardy flowering shrubs and plants to the greatest extent possible, partly because the greater part of our planting is seen by passengers while traveling at a high rate of speed, and shrubbery and hardy plants attract more attention than small, low flower beds; and partly because the use of shrubs entails very much less labor in their care during winter, and also obviates the necessity of planting out and taking up the plants each season."

Thus, by one train of reasoning or another, progressive railroad men are gradually sifting out the chaff and retaining the good grain of correct methods and artistic results in their gardening. But it would seem that, as a class, they are not reaching the pith of the subject as directly as is their custom in the more practical features of railroad business.

From Mr. Stiles' editorial (previously mentioned) we find that in 1889 the highest authority in the art of planting held the opinion that: "Up to the present time, with few exceptions, railroad gardening has failed to accomplish what the public has a right to expect of it from an artistic point of view. Instead of using their opportunities for increasing the taste and knowledge of the communities they serve, railroad managers have generally been satisfied to reproduce all that was glaringly bad in the prevailing horticultural fashion of the time. Perhaps this is inevitable, and it will continue so as long as they feel that they need not call for the advice of an expert of a higher class than the ordinary jobbing gardener. It is the old story—a man employs an architect to build his house, but thinks he needs no advice in laying out the park that surrounds it.

"The principles that underlie good railroad gardening are simple. They relate,—so far as such gardening has been attempted,—to the immediate surroundings of country stations and to the shaping and turfing of the slopes rising and falling from the permanent way.

"The essential features are: convenient and abundant approaches, and some treatment of the ground not needed for approaches. This treatment should be at once economical and permanent, and of a character simple enough to be successfully maintained by the station-master and his assistants, under the inspection and with the occasional advice of a higher official charged with the management of the horticultural affairs of the corporation.

"The selection of a system of general treatment is the only difficult thing, and it is here that railroad managers have usually failed. Most railroad gardens,—and this is as true of Europe as of America,—consist of a badly laid out and constructed approach, bordered with turf in which are cut as many large and often grotesquely-shaped beds as can be crowded in and filled during four months of the year with the most showy and ill-assorted plants, and quite bare of all covering during the remaining eight months; of a few shrubs, mutilated almost past recognition by bad pruning, and by a clump of pampas grass to complete the decoration; also often the name of the station in stones (mere 'toys'). As Bacon wrote three centuries ago, 'You may see as good sights many times in tarts.' Such grounds are not artistic, therefore bad from the point of view of the public. They are enormously expensive and difficult to maintain, therefore bad from the point of view of the railroad.

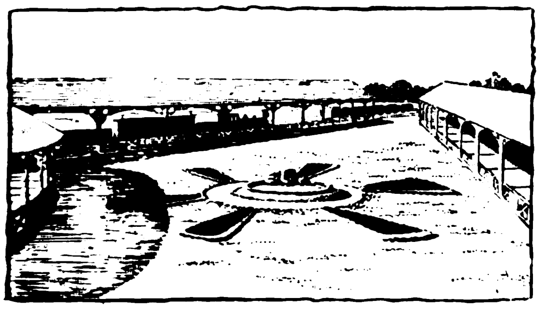
"If railroad gardening is ever to become a potent and permanent means of public education, it must be organized upon a more economical basis, and with more regard to the laws of good taste and good business. This subject has already occupied the attention of a few thoughtful men, and we are confident that some progress has at last been made."

Mr. Stiles goes on to commend the plans of the then new station-grounds of the Boston & Albany railway for "convenience, neatness and simplicity. No beds, no brilliant flowers, no startling effects. They rely for attractiveness on convenient, well-kept roads, neat turf, a few good trees, and masses of well-selected and well-planted shrubs, among which herbaceous and bulbous plants are allowed to grow. The plan is simple, and when thoroughly carried out in the beginning it is easy to maintain." This editorial seems succinctly to express the crystallized ideas of the lamented editor of Garden & Forest on the subject of railroad gardening.

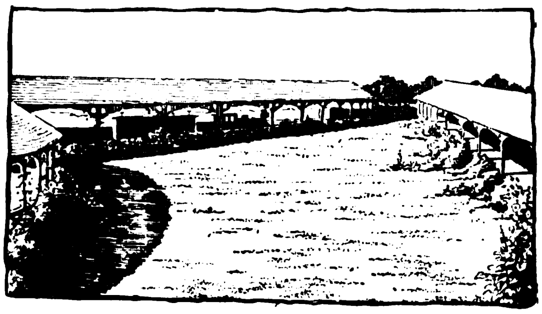
In 1882 and 1884 several new and exceptionally artistic stations had been built for the Boston & Albany Railway Company after designs by the late eminent architect, H. H. Richardson, and the latter date marks the adoption of a consistent scheme of permanent planting, aiming at nature-like effects instead of the purely ornamental, i. e., formal gardening, previously used. This happy result was due to the influence of Prof. Charles S. Sargent, of the Arnold Arboretum, a director of the road, and to Mr. Wm. Bliss, its president. Designs for the improvement of the grounds around these stations were made by F. L. Olmsted, the veteran landscape architect, and since 1884 the development of these plans, as well as all of the horticultural interests of the road, have been in charge of a competent landscape gardener, Mr. E. A. Richardson, who says: "The plan followed is to conform the treatment and development of the station-grounds to the adjacent ground: a natural style being followed amid natural surroundings, and a more cultivated style in highly cultivated regions; to utilize all natural advantages of ground surface, rocks, water and native growths; to make large use of trees, shrubs, vines and plants indigenous to the locality where improvements are being made; to supply beds for shrubs with from eighteen to twenty-four inches of good loam; and to plant so closely in the beginning that as the plants grow they can be thinned to supply other grounds as needed." It goes without saying that these methods are not only the most practical but that they insure the most artistic results.

Railroad Gardening in Florida.—Possible development of railway horticulture is limited in the southern states only by the taste and work expended. With logically treated station-grounds southern railways would become pleasant highways studded with charming groups of foliage and bloom, expressing the type of the country traversed and marking the advance into a different climate. Florida, especially, should become celebrated for its railroad gardens. Its chief "crop" is conceded to be the winter tourist, and nothing appeals more strongly to this class than the contrast of luxuriant vegetation with northern ice and snow. Each station-ground should be planted to emphasize this contrast on a gradually increasing scale, to reach its climax in the novel and effective semi-tropical vegetation possible in the southern part of the state. Such a planting scheme should commend itself as the best advertisement for securing both pleasure-seeking and home-seeking patronage. Little has been done so far, although the Florida East Coast Railway Co. has improved several of its station-grounds, notably, with decorative plants at St. Augustine and with roses at Ormond, but the planting on this line is largely in the way of demonstrating horticultural possibilities for the benefit of home-seekers and property-owners (peach trees around its section houses being an example of practical results shown), and viewed in that light is considered a success. The Florida division of the Southern Air Line, and the Jacksonville & Southwestern railroads have done similar planting. All that has been done is ineffectual compared to the possibilities, for roses and half-hardy shrubs thrive throughout the state, while south of the 27th parallel semi-tropical plants make fine growth and bloom profusely.

Possibilities in California.—California offers limitless opportunities for railway horticultural development ranging from the semi-tropical growths of the citrous belt to the alpine plants on the verge of the everlasting snow that caps the mountains. A few examples of railroad gardening that existed in the southern part of the state about 1890 were maintained wholly by private enterprise as a means of advancing real estate interests. Some years later, however, embellished station-grounds aggregating a goodly number existed. But these were scattered, the state being so large that no railway company could afford to establish gardens throughout the extent of its lines at once, and the most progressive communities secured the first improvements of this class. The Southern Pacific Railway Company was the originator of the work and has expended large sums in beautifying choice spots along its route, as at Merced, Fresno, Santa Monica, Pomona, Pasadena, Riverside. The range of soil and climate is wide. At Los Angeles there are palms dating from the Spanish occupation, a collection of semi-tropical shrubs, and a display of yuccas, cacti and other curious vegetation from the Arizona desert.



2068. One method of treating a railway ground.



2069. A better method of treating the area.

Roses in bloom all winter are the special attraction at several points. Along the ocean, where difficult horticultural problems are met, the use of mesembryanthemums, eucalypti and other succulents is general. Where water is available, passifloras, ipomeas and the tropical hibiscuses make a wonderful show. In some places acres of bamboos, planted closely in shifting sands, are of great value. (Water is essential for their establishment.) Some of the best railway gardens are on the Monterey line from San Francisco past San José to the ancient capital of the state. At Castroville there is a picturesque "wilderness" garden overflowing at all seasons with fragrance and bloom, and the little railroad gardens along the "peninsula" (San Mateo county) have a more finished aspect than any others in the state.

Johannes Reimers, landscape gardener of the San Francisco & San Joaquin Valley Branch of the Santa Fé road, furnishes the following information: "For lawns, we use exclusively a mixture of Australian rye grass 90 per cent and white clover 10 per cent. We find that this mixture gives a lawn better able to withstand the heat, drought and poor soil usually furnished for filling than any other. The grass retains its dark, rich color even when almost dying from thirst, and makes a strong turf that is not likely to burn even when watered in the heat of a cloudless summer day; and it also requires less water and less fertilizer than either bluegrass or timothy. We make much use of a regular form of the Pride of China tree (*Melia Azedarach*), known as the Texas umbrella tree, for shade around buildings and for avenues. Its low, spreading form makes it harmonize with the broad-roofed Spanish style of architecture used for our buildings. It is a rapid grower and is not deformed by the continuous northwest trade-winds."

Other trees and plants mentioned include the paulownia, pepper, catalpa, mulberry, fig, the brachychiton (Sterculia) and casuarina, which latter does exceptionally well, eucalypti, acacia in all except the most tender varieties, grevillea, ligustrum, magnolia, *Fraxinus Californicus* and *F. excelsa* where water is available, crape myrtle, abutilon, oleander and pomegranate (both the last do magnificently), olive and carob which do finely, and roses, which are inclined to burn and to stop flowering during the heat of midsummer away from the coast. Vines used are passifloras, which thrive in the heated valleys, bignonias and wistarias, also jasmines, which incline to burn when used in the interior of the state, as do also maple trees. Of palms, Pritchardia and Washingtonia are as easily grown as onions; *Phœnix Canariensis* does well, and Chamærops grows slowly. A long list of plants, tender in the east, are mentioned, among them geraniums, which are spoken of as being "killed to the ground away from the coast some winters." The plants that have proved best adapted to alkali soils are: Phœnix, Pritchardia and Washingtonia among palms, the European sycamore, cottonwood, olive, crape myrtle and some eucalypti. Mr. Reimers is of the opinion that: "The gardens of California should be given a classic Mediterranean aspect. It has the climate, the coloring of rock, of soil and of sky, together with the warm blue sea of Italy, Spain and Greece. The stateliness of the cypress has not been appreciated here; and what might not be done with the fig, the olive and the palm on these hillside slopes?"

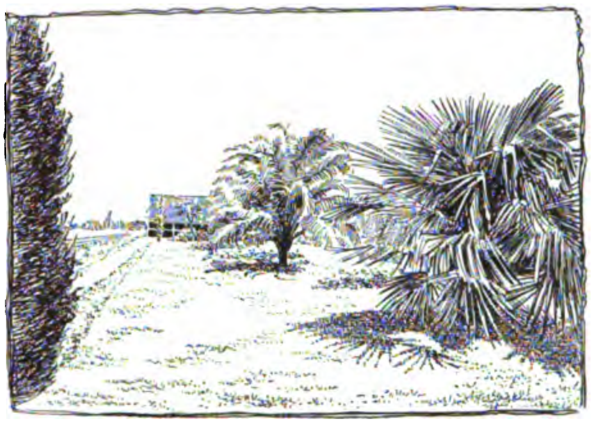
Mr. Chas. H. Shinn, of the California Experiment Station, says: "There seems no doubt that the time will come when one of the special features of travel in California will be the horticultural display at thousands of small railroad gardens scattered along every valley and mountain from San Diego to Siskiyou."

Treatment of the Right of Way Between Stations.—On this point the Garden & Forest editorial previously quoted says: "What is needed is a ground covering that will be more permanent than turf and will not need its constant cutting and attention, and which can be secured without the enormous first expenditure for accurate grading and the deep soil that makes a grass slope presentable," and adds: "Such low plants as wild roses, dwarf willows and sumacs, sweet fern, bayberry, etc., when once established will prevent surface soil from washing, will not grow tall enough to interfere with operating the road, and if destroyed by fire would soon grow again from the root and re-cover the ground."

The proof of these deductions is seen yearly on many roads, where thousands of miles of railroad rights of way which, in the spring and early summer, are like ribbons of flowered brocade linking the towns together but later in the season become blackened wastes from accidental or intentional fires. Year by year this mournful program is repeated.

Railway officials offer no practical objections to the use of small trees and of shrubs between stations that apply when they are placed with discretion; viz., on the outer boundaries of rights of way that are 100 or more feet wide, on straight stretches, or on long tangents, and not on short curves or near grade crossings. The tracks should never be menaced by the danger of trees falling across them in wind storms, nor should the telegraph wires and poles be interfered with, nor the view of the line obstructed. The danger to planting from fire can never be entirely eliminated until some non-spark-producing fuel is substituted for coal.

Can the horticultural department of a railroad be made partly self-supporting? There seems little doubt that by one means or another this department might be made at least partly self-supporting, but the consensus of opinion among railroad men is distinctly against the advisability of making it so, except indirectly.


2070. Railroad yard in southern California.

It is conceivable that railroad nurseries and greenhouses might supply planting stock to individuals to their advantage; and possibly railway rights of way aggregating immense areas might be planted to crops, perhaps to fruit trees as is done to some extent in European countries (a project which has also been recently suggested for the roads of India), but the opinion is general that legitimate railroad business is limited to the transportation of people and of freight. Even if this is true, it is still certain that the department may legitimately be made to yield substantial financial returns. This feature of the department work is as yet in a preliminary stage that makes definite conclusions as to the extent of its benefits impossible, but enough has already been done to demonstrate the usefulness of a well-conceived and correctly developed policy of protective and economic planting.

Planting for Protection.—Planting for protection, as practiced so far, includes: (1) covering banks with vegetation to prevent erosion, and (2) planting for protection from wind and snow, and from landslides. All this has been successfully done in various parts of the world. Snow hedges are comparatively common at home and abroad. A notable example of confidence in the advantage of belts of trees for this purpose is seen in the groves planted recently by the Northern Pacific Railway Company. About 600,000 trees were set out in 1900, and the chief engineer of the road says: "This experiment has been undertaken to determine the possibility of substituting groves for snow fences. It is necessary to protect all railway cuts in these prairie regions in some manner, as the strong winds across the treeless prairies cause the snow to drift badly. A strip 100 feet wide is cultivated to keep down weeds and overcome danger from fire, and through the middle of it runs a grove 60 feet wide, the inner edge being 125 feet from the center line and parallel with the tracks through cuts. The trees are planted in parallel rows spaced 6 feet apart at right angles with and 3 feet apart parallel with the track. The two outer rows on each side are golden Russian and laurel-leaved willows; the third row from the outer margins, box elder and ash; and the five central rows, cottonwood. This arrangement is expected to produce a dense grove, increasing in height from both sides to the center, which will furnish an effective wind-break."

The feasibility of planting for protection against the encroachment of shifting sand on the seacoast, along rivers and on so-called desert lands, has been demonstrated by the researches and experiments of the Division of Agrostology of the United States Department of Agriculture. The advantages of such plantings are sure to be eventually recognized and utilized by railway companies whose lines are exposed to this danger.

Planting for Economic Purposes.—Possibilities are considered great in the direction of producing timber for furnishing cross-ties, poles and posts. It is asserted that under competent supervision this branch can be made not only to pay the entire expenses of the department but to become a source of revenue. This branch of the work appeals to practical railway men as perhaps no other phase can be expected to, and to what extent the fortunes of various groves of locust, catalpa and tamarack influence the happiness of dignified chief engineers it would be difficult to learn, but that numbers of them are turning otherwise unoccupied railway lands to this use is certain. In the state of Indiana some railway companies have planted a part of their holdings with trees for the double purpose of growing timber for economic uses and to secure the resulting reduction in taxes, which is a feature of the state forestry law.

Protection of Natural Scenery.—Notwithstanding the prominence given in railway advertising to fine natural scenery, little credit seems due to railway companies in general for protecting such scenery. That they might wield a mighty influence for their own and the public good is proved by a few instances. It is learned that the unofficial work of representatives of the New York Central and the Michigan Central roads did much to create the public sentiment that led to the formation of government parks on each side of Niagara Falls, and that the same roads should be credited with comprehensive and extended efforts to secure legislation looking to the prevention of further defacement of the palisades of the Hudson.

Disagreeable Features and their Suppression.—There are two important classes of disfigurement: defacement by signs and defacement by abused and neglected grounds adjoining railway rights of way. The more noticeable of these is the display of hideous sign-boards that disfigure railway rights of way and, indeed, seem to have the right of way on highways of every description. These amount to a public nuisance that should be legally controlled, but as they are placed on adjacent land or buildings instead of on railway property, their direct suppression by railway officials is out of the question. These eyesores, however, furnish an added and cogent reason for massing plantations of small trees, shrubs and vines at certain points along rights of way where the topography of adjacent land invites such disfigurement. These gaudy signs not only blot out or mar most fine landscape views (being adroitly placed to that direct end), but are allowed to distort otherwise unobjectionable farm buildings, while the approach to villages and towns is announced in screaming colors by the crowding together of these frightful adjuncts of civilization.

While railway companies are not strictly responsible for these conditions, it is certain that they might sway public opinion and effect a much needed reform by continuous, systematic work in the way of "planting out" the disfigurements, and by establishing attractive plantations wherever possible. This policy is likely to result in a reformation in the direction of the second source of unpleasant views from trains; viz., the unkempt, sordid and often wretchedly squalid appearance of grounds adjoining rights of way through villages, towns and small cities. If a park is maintained on the station-grounds, near-by residents are likely to catch the good spirit and improve the looks of neighboring back yards. To this end, a rule against dumping on railway ground should be strictly enforced. The objectionable features that obtain in large cities must probably be endured until mitigated by the efforts of municipal art and social service leagues.

Attainable Ideals.—Railway companies can do no

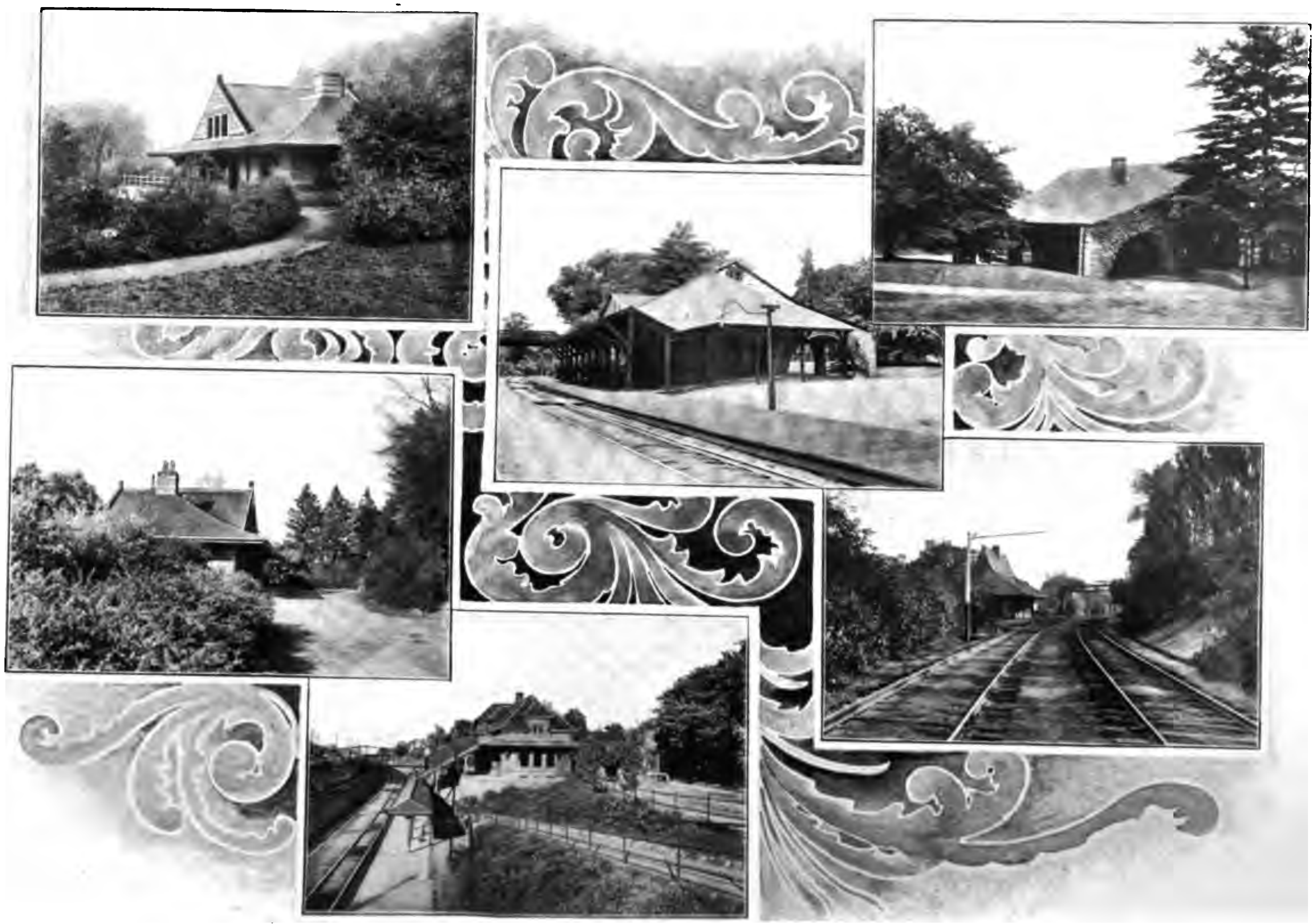


Plate XXXII. Railroad Gardening.

Showing how the principles of nature-like landscape gardening may be applied to station-grounds. Examples from the Boston and Albany Railroad. Wellesley Station is shown in the two views at the left, and Chestnut Hill at the upper right-hand picture and the adjoining one.

more effective advertising than by demonstrating the possibilities of the country traversed for home-making. Instead of dreary wastes of dust and cinders, their way-station grounds should present refreshing scenes of shade and verdure. Their grounds should be treated according to the rules of landscape art that hold good in all planting. Where adjacent land drops away giving good vistas, these should be preserved; objectionable features should, as far as possible, be "planted out;" sky lines should be varied, banks clothed, and variety and views supplied, particularly in flat and uninteresting regions.

In short, railroad gardens should be in the hands of those who will adorn instead of deface them; who will look to the formation of features that will take care of themselves after planting is established—features that require considerable expenditure, a good knowledge of trees and of shrubs, and a large amount of taste in the designer at the outset, but after being established, like the island gardens of Paris, "the hand of man might be withheld for half a century without their suffering in the least."

Railroad Gardening Literature.—"Seven Lamps of Architecture," by Ruskin. "Landscape Gardening," by Samuel Parsons, Jr. "Ornamental Gardening for Americans," by Elias A. Long. "Der Städtebau" (Vol. 9 of Part 4 of "Handbuch der Architektur"), Press of Bergstrasser, Darmstadt, 1890, by J. Stübben. Bulletins of the U. S. Dept. of Agric., Division of Forestry, especially No. 1 (1887) and No. 7 (1893). "Garden and Forest," Jan. 16, 1889; Mar. 13, 1889; Apr. 3, 1889; May 1, 1889; Oct. 4, 1893; Oct. 23, 1895. "Railroad Gazette," June 2, 1882; May 9, 1884; Oct. 7, 1887; Oct. 21, 1887; Mar. 10, 1893; Apr. 7, 1899; Nov. 3, 1899; Feb. 16, 1900. "Railway and Engineering Review," Oct. 25, 1890; Oct. 23, 1897; Sept. 9, 1899; Sept. 23, 1899; Apr. 14, 1900; Sept. 29, 1900. "Railway Age," Sept. 28, 1900. "Railway World," Apr. 7, 1877. "Park and Cemetery," July, 1899. "Park and Cemetery and Landscape Gardening," March, 1900; May, 1900. "Country Gentleman," Aug. 23, 1900; Aug. 30, 1900.

FRANCES COPLEY SEAVEY.

RAIN-BERRY. *Rhamnus cathartica.*

RAINBOW FLOWER. *Iris.*

RAISIN. Fig. 2071. Up to about 30 years ago, practically the entire Raisin industry of the world was confined to the Mediterranean districts of Europe and Asia. While it is true that Raisin vines were planted in other widely distant countries at a much earlier date, e.g.—Chile, where it is said they were known 200 years ago—it was not until the early 70's that the Chilean Raisins, as well as those of the newer districts of California and Australia, were actually found in the markets of the world. Since that time, however, the development of the industry in these new districts has been most rapid, and it has been shown that even higher quality and flavor are possible.

In California the growth of the Raisin industry has been enormous, the output now reaching about 100,000,000 pounds annually, or more than the entire yearly consumption of the United States a few years ago. In 1894, the growers found themselves face to face with what was then thought to be a serious problem of overproduction. The price of Raisins fell below the cost of production. Lack of system in marketing has since been shown to have been the cause, for by coöperative methods in grading, packing and marketing, the industry has again been placed on a sound and fairly remunerative basis.

The first importation and planting of the vines were made in 1851, but it was not until 1863 that the first California cured Raisins were exhibited at the State Fair, and it was not until 10 years later that the first large-scale vineyards (one at Davisville, Solano county, and another at Woodland, Yolo county) came into full bearing. One hundred and twenty thousand pounds were produced that year, nearly all by these two vineyards. Planting in various parts of the state followed. Fresno, Riverside, El Cajon valley in San Diego county, Los Angeles and Orange counties soon became important centers of the industry; but the production of citrous fruits has now largely superseded Raisin-growing in all the last mentioned except the Fresno district, where at present three-fourths of the entire output of the state is produced. The acreage is now about 50,000, with nearly 45,000 of these in the Fresno district, including Tulare, Merced and Kern counties. The climate of this region is eminently suitable for Raisin culture. The summers are hot and dry and the winter rains scanty and late, thus insuring a high saccharine content of the grapes and ample opportunity for sun-curing, by which means alone, it is thought, Raisins of high quality can be produced. As the system in vogue in all districts is essentially the same as that in Fresno, a short résumé of the practices of that region will suffice.

Alluvial soils and deep upland loams of the plains are considered the best. Irrigation is absolutely necessary. At first flooding and furrow irrigation were practiced, but since the placing of the ditches the water has escaped into and completely filled the loose soils (in some cases originally 60 ft. deep) from below, thus producing a system of "subirrigation," as it is called there; and it is in this way that most of the vineyards are supplied with water at present. Indeed, in some localities, it is no longer a question of how to bring the water to the land, but more how to keep it out. Serious damage has resulted in some of the lower vineyards, where the seepage water has completely swamped the land. "Tight" canals and ditches at the start would have avoided this trouble, but it was not realized until too late.

The vines are all headed low, six inches being the favorite height for the stump. With the exception of the "Seedless Sultanas" and the "Thompson Seedless," which require long pruning, the canes are cut back to 2 or 3 eyes; the number of canes left varies from 5 to 15, according to the age and size of the stump. Summer pruning is seldom practiced. Clean, thorough tillage is maintained until the vines cover the ground and obstruct operations. The grapes ripen about September 1, and are allowed to become thoroughly ripe before they are gathered. When the sugar percentage has reached 23 or 24 per cent, the fruits are considered ripe. The bunches are then cut with small shears (care being taken not to rub off the bloom), placed on wooden trays and exposed to the sun. The time required for full curing ranges from 10–12 days for the earlier grapes to as long as three weeks for the later ones. When the juice has reached about the consistency of jelly the Raisins are placed in "sweat boxes" to undergo the "sweating" process, in order to equalize the moisture-content throughout the whole mass. The Raisins are then ready for grading and packing. A great many brands and grades have been packed, designated at first much the same as the imported ones, but lately, the Association has endeavored to establish and maintain distinctly Californian brands. "6-Crown Imperial Clusters," "5-Crown Dehesas," "4-Crown Clusters," "3-Crown" and "2-Crown London Layers" are some of the principal brands. The loose or detached berries are, of course, always marketed separately as distinct grades. A great many have lately been "seeded" by means of a specially designed machine, put up in 1-pound and ¾-pound packages, and marketed for cook-

2071. Table or cluster Raisins and "loose cooking" Raisins (× ⅛).

ing purposes. Some "bleached" Seedless Sultana and Thompson Seedless are prepared, and command a higher price for no other reason than that they are considered more pleasing to the eye. The delicious flavor and aroma are entirely destroyed in the bleaching with sulfur, and all possible efforts should be made to discourage the practice. Few, if any, "dipped" Raisins are now prepared.

The varieties planted are: White Muscat of Alexandria, the Muscatel Gordo Blanco and Malaga; and for seedless Raisins, the Seedless Sultana and Thompson Seedless. It is safe to say that the first two are the prevalent varieties and produce the finest Raisins. The Gordo Blanco is the favorite with some on account of its large uniform berries and full, even symmetrical clusters. The seedless varieties are both small. "Currants" (which, by the way, are not "currants" at all, but the cured fruit of the Zante or Corinth grape-vine) are only partially successful, and as they command a lower price, are not considered profitable in California.

The Raisin vines are subject to the same diseases and insect pests as are the wine and table varieties of the *Vitis vinifera* type, and these are combated by the usual methods. Downy mildew is unknown in California, and up to the season of 1900 no phylloxera had made its appearance in the Fresno vineyards. In the fall of that year, however, it was discovered in the district, and to what extent it will reduce the acreage, will, of course, depend upon the vigilance of the growers and promptness with which replantings with resistant stocks are made.

Of late years high assertions have been made for the Salt river and Gila valleys of Arizona as Raisin regions. It is said the grapes ripen earlier and have that advantage over the California districts, as well as that of being nearer to market. How far these advantages will count against the California Raisin in the competition remains as yet to be seen.

For a complete and detailed account of Raisin-growing and curing, as well as a bibliography of the subject, see "The Raisin Industry," by Gustav Eisen; also, "California Fruits, and How to Grow Them," by E. J. Wickson. ARNOLD V. STUBENRAUCH.

RAISIN-TREE, JAPANESE. *Hovenia dulcis.*

RAMÓNDA (L. F. E. von Ramond de Carbonnières, French botanist and traveler, 1753–1827). Often spelled Ramondia, but originally written Ramonda. *Gesneràceæ. Ramondia Pyrenaica* is one of the choicest and most popular alpine plants. Few, if any, inhabitants of rock gardens have been so often pictured. It is a small, tufted, hardy perennial herb, like most alpine plants, and its scapes bear one or few fls. in spring. These are an inch or so across, and normally purple or violet, but there is a pure white variety which is in great favor. The Ramondas vary in the number of their petals, or rather corolla-lobes. For example, *P. Nathaliæ* often has 4-lobed and 5-lobed fls. on the same plant. The floral parts in the genus are in 4's, 5's or 6's. These plants are rare and local in Europe and are interesting as being among the few alpine survivors of a family that is now essentially tropical.

A genus of about 3 species: corolla with scarcely any tube, rotate or broadly bell-shaped: perfect stamens as many as the corolla-lobes, affixed at the base of the corolla: ovary superior: capsule oblong: seeds minus. Ramondas are woolly or villous plants with soft, wrinkled leaves. The plants require perfect drainage.

Although three Ramondas are in the trade, only one is well known. This is *R. Pyrenaica*, which is hardy in the eastern states. It is a beautiful, dwarf, alpine plant well adapted for the rock garden. It is rather hard to establish but can be easily grown from seed. If seeds are sown in the spring, and the small plants grown along in pots for the first summer and kept in a cool shady position, they will make neat little plants by the end of autumn. They should be kept in a coldframe for the winter. These one-year-old plants grown in pots are much easier to establish than younger plants. They can be planted in small pockets in the rockery in a slightly shaded and elevated position, and given good, deep, peaty soil. When the plants get established they will blossom freely, and if allowed to ripen their seed they will sow themselves freely amongst the rocks. Old plants can also be increased by division. They ought to be covered in winter with some hay or dry leaves so that they will not be heaved out of the ground by the alternate thawing and freezing.

2072. Ramonda Pyrenaica (× ⅓).

A. *Color of fls. purple or white.*

B. *Corolla 5-parted, rotate.*

Pyrenàica, Rich. Fig. 2072. Sometimes called Rosette Mullein. Well-grown specimens may have 6–12 scapes, each bearing 3–4 fls. 1⅓ in. across. Native of Pyrenees. Many inferior forms have been sent out in the name of var. **alba.** Gn. 26, p. 129 (repeated in 27, p. 197); 29, p. 343 (repeated in 44, p. 555); 27, p. 197; 37:735 and p. 31; 51, p. 205; 56, p. 228. G.C. III. 12:vii. J.H. III. 34:187. R.H. 1866:330. B.M. 236 (*Verbascum Myconi*).

BB. *Corolla 4-parted, more concave, short bell-shaped to funnelform.*

Héldreichi, Janka (*Jancæa*, or *Jankæa, Héldreichi*, Boiss.). Lvs. ovate, entire, obtuse, silky white above, rusty-woolly below: scapes 1–2-fld.: fls. violet. According to Boissier it normally has a 5-parted calyx, 4-lobed corolla and 4 stamens. Thessaly. Gn. 55, p. 394.

AA. *Color of fls. yellow.*

Sérbica, Pauc. This is said to be distinguished by its blue anthers: also the fls. are said to be normally 5-lobed. Servia.—*R. Natháliæ* seems to be a variety that is more commonly 4-lobed than the type. S.H. 1:161.

ROBERT CAMERON and W. M.

RAMÓNDIA. See *Ramonda*, above.

RAMPION (*Campanula Rapunculus*) is a vegetable sometimes cultivated for winter salads. The roots are chiefly used, generally in a raw state, but the leaves may also be used as a salad. The roots are white, a foot or so long, and spindle-shaped, like a long radish. They are ready for use in Oct. or Nov. and may be used all through the winter. According to Vilmorin's "Vegetable Garden," the seeds of Rampion are the smallest of all kitchen-garden seeds, and their germinating power lasts five years. The seed may be sown in the open ground, either broadcast or in drills. The precautions usually taken with minute seeds must be observed. In order not to sow the seed too thickly it is well to mix it with sand. The seed should not be covered, merely firmed into the soil. Frequent and careful waterings are necessary until the plants become established. Thinning is an important operation. Every plant allowed to remain should have at least 4 inches each way for development. The plants like a light, rich soil, partial shade and water during the hot season. Although Rampion is a biennial plant it sometimes runs to seed the first year, especially if the seed be sown early. It is, therefore, sometimes advisable to postpone seed-sowing until June. For botanical description, see *Campanula*.

RAMPION, HORNED. *Phyteuma.*

RAM'S HEAD. *Cypripedium arietinum.*

RAMSTED. *Linaria vulgaris.*

RÁNDIA (Isaac Rand, author of an index of plants cult. at Botanical Gardens of the Society of Apothecaries at Chelsea, published 1730 and 1739). *Rubiàceæ.* A genus of about 100 species of tropical shrubs, trees, and woody climbers. Plants often spiny: lvs. opposite, obovate-oblong to lanceolate, frequently coriaceous; stipules between the petioles and stem, short, and usually joined together: fls. white, yellow or reddish, small or large, axillary or rarely terminal, solitary, corymbose, or fascicled: fr. a berry, globose or ovoid, 2-loculed, many-seeded. For distinctions from Mitriostigma and Gardenia, see *Gardenia.*

A. *Shrubs having spines.*

dumetòrum, Lam. (*R. floribúnda,* DC.). A small tree or rigid shrub with stout, straight, often long spines: lvs. 1–2 in. long, short-petioled: fls. white or greenish yellow, fragrant, not large, solitary or rarely 2–3 on a peduncle; corolla ½–¾ in. across: berry globose or ovoid, ¾–1½ in. long, yellow. Tropical Asia. Cult. in S. Fla.

AA. *Shrubs or trees without spines.*

B. *Corolla-tube ½ in. long.*

Fitzálani, F. Muell. A glabrous tree: lvs. often over 6 in. long, shining, obovate-oblong or elliptical, obtuse; petiole rather long: fls. about 1 in. across, in loose, few-fld. cymes or the fertile fls. solitary: fr. globular, 1½ in. thick or ovoid and longer, hard. Australia. Cult. in Fla.

BB. *Corolla-tube 4–10 in. long.*

C. *Lobes of corolla obtuse.*

maculàta, DC. (*Gardènia Stanleyàna,* Hook.). A much-branched shrub 10–15 ft. high: lvs. elliptical or obovate-oblong, 1½–5 in. long, ⅜–2½ in. wide, chartaceous, acuminate, narrowed at base; petiole usually with glands near its union with the midrib: fls. usually purple with white lobes, solitary, terminal or at ends of short lateral branches, sessile: fr. oval, oblong or globose, pointed, 1¾–3 in. long. Tropical Africa. R.H. 1894:60. B.R. 31:47. B.M. 4185. Gn. 38:773.

CC. *Lobes of corolla acute.*

Ruiziàna, DC. A tender shrub with dark green, lanceolate, acute lvs., and white or pale yellow fls. terminal, solitary, sessile: corolla-tube somewhat hairy; lobes spreading: fr. cylindrical, yellow, 10-nerved. Brazil, Peru.

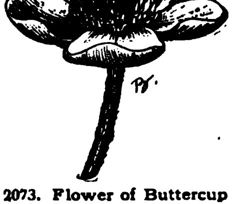
F. W. BARCLAY.

RANÊVEA (anagram of *Ravenea,* and now first published). *Ravènea* of Bouché. *Palmàceæ.* One species of palm allied to Hyophorbe, from which it differs, among other things, in its dwarfer habit, usually diœcious flowers, and in the flowers being arranged alternately on the short branches of the spadix. Bouché's generic name *Ravenea* dates from 1878. It appears in Bentham & Hooker (3:883) as *Ravenia.* In spelling it is so similar to *Ravenia* of Vellozo, 1825, that the two cannot be distinguished by pronunciation. In the interest of perspicuity, therefore, the name is here changed to *Ranevea,* since both this plant and *Ravenia* occur in the American trade.

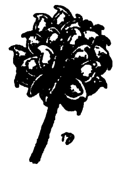
Hildebrandtii (*Ravènea Hildebrandtii,* Bouché). Becoming 8–12 ft. high, but flowering under cultivation when half that height, spineless, erect: lvs. elliptic-oblong or ovate-oblong in outline, long-stalked, pinnate, the pinnæ 20 or more pairs and narrow-lanceolate-acute: spadix long-stalked, the staminate recurved and with short densely flowered spreading branches, the pistillate erect with filiform strict branches thickened at the base: fls. pale straw-color, the calyx 3-lobed, the petals 3 and joined at the base, the stamens 6: fr. black. Comoro Islands (east of Africa). I.H. 27:403. B.M. 6776. G.F. 4:259.—An excellent dwarf palm, described by W. Watson to be "as elegant as *Geonoma gracilis* and as sturdy as a Kentia. It deserves to take a prominent place among garden palms, its small size, free habit, elegance, good constitution, being all in its favor, while in the freedom with which it flowers and produces seed we have an exceptional character among dwarf palms." Perfect flowers are sometimes produced, although the plant is habitually diœcious. Ranevea is one of the most valuable Palms of recent introduction. L. H. B.

RANÚNCULUS (Latin diminutive for frog; many of the species grow in wet places). *Ranunculàceæ.* BUTTERCUP. CROWFOOT. The genus is by far the largest in the family, comprising fully 200 species. Ninety of these are native or naturalized in North America. Most members of the genus are naturally hardy, being found in mountainous regions and in cold and temperate parts of the globe.

Generic description: Perennial (rarely annual) herbs: lvs. alternate, simple, entire, lobed, dissected or divided: fls. yellow, white or red; sepals usually 5, deciduous or marcescent, persistent; petals 5 or more, conspicuous or minute, nectar pit and scale at base; carpels many, 1-ovuled; akenes generally flattened, smooth, papillose or spiny, borne in a head or spike; styles minute or elongated. For structure of the flower and fruits, see Figs. 1874, 2073, 2074. For the botany of the species native to America, see the Synoptical Flora of North America, vol. 1, part 1, fasc. 1, pages 20–39. The writer of the present article has treated the wild and cultivated species of America in Minnesota Botanical Studies, series 2, part 4, pages 459–508 (1900).



2073. Flower of Buttercup —Ranunculus acris. Natural size.



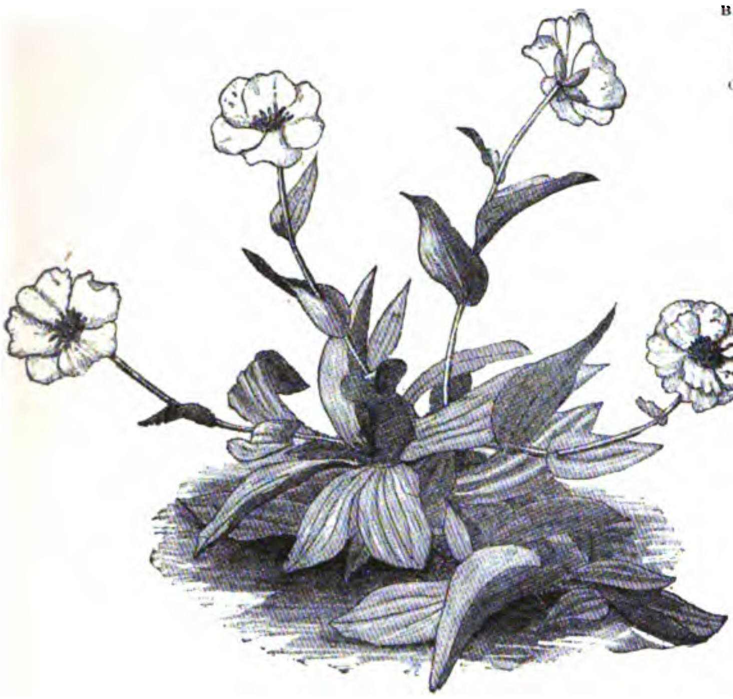
2074. Head of akenes of Buttercup.

The cultivated forms of *R. Asiaticus* are constantly increasing in number. They are of two main types: (1) the florists' section, called PERSIAN RANUNCULI, or true *R. Asiaticus.* These require more care than the others. They are quite variable in form and color, and are the most highly cultivated members of the genus. (2) The gardeners' section, called TURBAN RANUNCULI, or var. *Africanus.* Compared with the first section, these have larger, broader, 3-parted lvs., not so much cut: fls. larger and broader, with many crisp petals, not flat and spreading but erect and curved inward, forming a spherical flower, as in the double peonies. See No. 7.

K. C. DAVIS.

CULTURE OF THE ASIATIC RANUNCULUSES.—The culture of Ranunculuses in gardens and by florists has been confined chiefly to the Persian and Turban Ranunculus, *R. Asiaticus,* since the Asiatic species is far more attractive than the European. In England and in other European gardens, *R. Asiaticus* has been in cultivation a very long time. Parkinson mentions it in his Paradisus, published in 1629. He termed it "the double-red crowfoot of Asia." Since his time *R. Asiaticus* and its varieties have been greatly improved, both in size of flowers and variety of colors. The flowers are very double, almost globular in outline, and often exceed 2 inches in diameter, while the colors now embrace almost every shade except blue, and some are striped and variegated. A well-grown mass of these charming flowers when in full blossom is a sight not soon forgotten. They are not as well known in American gardens as in those of England or at least not in the eastern states, since the writer has rarely met with them or seldom seen any reference to them in the horticultural periodicals. They are not adapted to either spring or summer bedding. Their season of blossoming in this country is about the last week in May and the first week in June, which is too late for spring bedding, while the season of blossoming is too short for summer bedding. Therefore a position should be given them in the herbaceous border where they will receive some shade during the warmer parts of the day, or a level place in a rock garden with a northern aspect. The roots are tuberous, being like miniature dahlia roots.

They are not hardy, at least not in any of the northern states. The tubers should be carefully lifted after the foliage has all "ripened off" (which occurs usually toward the end of August), and stored until the following spring in some cool shed where they will not freeze. They should be planted as soon as the frost is well out of the ground in spring, about 2 inches in depth and about 6 inches apart, making the soil very sandy on top so that the leaves will push through readily without heaving the soil. Like their congeners the European Ranunculi, they like plenty of moisture at the roots during the growing season, and if they can be shaded from the sun when in flower their blossoming period will be materially lengthened. They may also be grown for flowering in the greenhouse. The writer usually grows a few pans each year, planting the roots in pans of light soil towards the end of January and placing them in the coolest greenhouse, where they will blossom towards the middle of April. The writer also prefers the Turban varieties, since they are stronger-growing and rather larger than the Persian. The species may be propagated by seeds, but this process is not worth while for most people because the bulbs may be procured so cheaply.


2075. Ranunculus amplexicaulis (× ½).

Of the native and European species of Ranunculus, those of the Batrachium section, such as *R. aquatilis* and its varieties, are interesting aquatic plants, while *R. repens*, var. *flore pleno*, and *R. amplexicaulis* are useful as subjects for the bog garden.

For herbaceous borders or moist corners in the rock garden *R. aconitifolius*, var. *flore pleno*, *R. cortusæfolius*, *R. anemonoides*, *R. parnassifolius* and *R. Ficaria* are the only species worth growing. These are readily propagated from seeds or by division of the plants in spring.

Edward J. Canning.

INDEX.

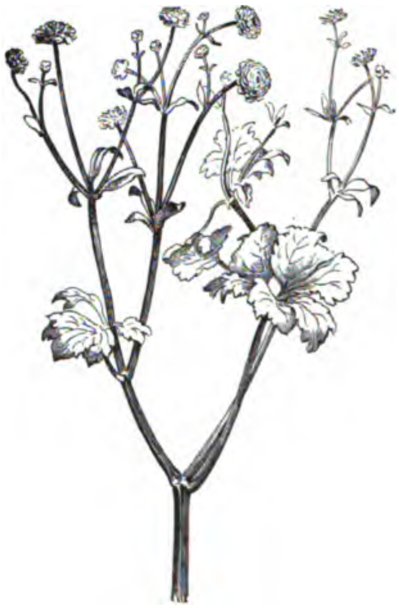
(See also the supplementary list.)

aconitifolius, 12.
acris, 11.
adoneus, 2.
amplexicaulis, 1.
Asiaticus, 7.
bulbosus, 5.
Californicus, 10.
Carpaticus, 4.
cortusæfolius, 9.
dentatus, 4.
flore-pleno, 11, 12.
luteus-plenus, 12.
maximus, 8.
montanus, 4.
orthorhynchus, 8.
platyphyllus, 8.
plenus, 12.
repens, 3.
speciosus, 5.
Suksdorfii, 6.
superbissimus, 7.

KEY TO SPECIES.

A. *Lvs. entire: blades of stem-lvs. amplexicaul: fls. white*......... 1. **amplexicaulis**
AA. *Lvs. somewhat lobed or divided.*
  B. *Fls. yellow (except in some double forms of R. Asiaticus).*
    C. *Foliage much lobed and parted into linear segments.* 2. **adoneus**
    CC. *Foliage with rather broad lobes or divisions.*
      D. *Plant spreading by runners or rootstocks.*
        E. *Akenes compressed, margined*............... 3. **repens**
        EE. *Akenes turgid*........... 4. **montanus**
      DD. *Plant not spreading by runners nor rootstocks.*
        E. *Roots decidedly bulbous*.. 5. **bulbosus**
        EE. *Roots not bulbous.*
          F. *Plants very low and glabrous*.............. 6. **Suksdorfii**
          FF. *Plants usually much taller and more or less hairy.*
            G. *Fruit borne in a spike.* 7. **Asiaticus**
            GG. *Fruit borne in a globose or oval head*
              H. *Beak of akene as long as the body, straight*......... 8. **orthorhynchus**
              HH. *Beak of akene nearly as long as the body, but recurved*........... 9. **cortusæfolius**
              HHH. *Beak of akene very short.*
                I. *Upper stem-lvs wanting: petals normally 6–15*..10. **Californicus**
                II. *Upper stem-lvs. present: petals normally only 5*.11. **acris**
  BP *Fls. white (except in some double forms)*................12. **aconitifolius**

1. **amplexicaulis**, Linn. Fig. 2075. Stems erect, 5–10 inches high, with 2–3 flowering branches, glabrous: lvs. entire, ovate to lanceolate, amplexicaul, acuminate,


2076. Ranunculus repens, Double-flowered (× ⅓).
Tip of a decumbent plant, which roots at the joints.

glabrous or at first with hairy edges soon becoming glabrous, glaucous: fls. 3–6, either terminal or axillary, pure white, with yellow stamens; sepals pointed; petals much larger, obtuse. Mts. of S. E. Eu. B.M. 266 (poor). L.B.C. 16:1593. J.H. III. 35:345. G.C. II. 19:788.

2. **adòneus**, Gray. Plant shaggy-hairy, 4–12 in. high, sometimes becoming decumbent: root slender-fibrous: lvs. usually 2–3-times 3-parted and lobed; lobes all narrow-linear, acute ;. primary divisions of lvs. sessile or nearly so; petioles of basal lvs. membranous in lower part; stem-lvs. sessile or on a sheathing base, usually borne opposite, resembling an involucre: petals 5 (or 6 to 8), large, yellow, rounded outwardly, cuneate at base, much exceeding the lanceolate sepals which are hairy beneath: akenes somewhat compressed, acutish; style long, straight, subulate: head globular to oblong. Summer. Rockies of Colo., altitude 10,000 ft. – Int. 1881. Procurable from dealers in Colorado plants.

3. **rèpens**, Linn. Plant more or less hairy, spreading by runners: roots fibrous: fl.-stems often ascending 6–12 in.: lvs. petioled, 3-divided; middle lft. or all lfts. stalked, often again 3-lobed or cleft, and somewhat coarse-toothed, bases cuneate or truncate: petals obovate, 5–6 lines long; sepals much shorter, spreading, hairy below: akenes compressed, margined; beak short, stout, slightly bent: head globose. May–July. Low places, from Nova Scotia and Newfoundland to Va. and westward; also Eu. and Asia.—A double-flowered form (var. *flore pleno*), Fig. 2076, is not uncommon in gardens.

4. **montànus**, Willd. MOUNTAIN BUTTERCUP. Plant 6 in. high, pubescent, with soft appressed or spreading hairs, especially toward the top: rootstock creeping, 1–3 in. high, ⅛ in. thick: radical lvs. few, petiolate, smooth, orbicular in outline, 3-parted, and lobed into blunt-toothed segments; stem-lvs. sessile or nearly so, clasping the stem, 3–5-parted into narrow somewhat toothed or entire lobes: fls. solitary, terminating the simple or once-branched stem, 1 in. across or larger; sepals concave, acute, yellowish green, slightly hairy; petals 5, large, broadly obovoid, bright yellow, with small scale and pore at base: akenes turgid, glabrous; beak strongly hooked, puberulent. May–July. Eu. B.M. 3022. L.B.C. 17:1610.

Var. **dentàtus**, Baumg. (*R. Carpáticus*, Herbich). Lvs. much more toothed than in the type: plant much taller: fls. larger. B.M. 7266. Gn. 52:1138.

5. **bulbòsus**, Linn. (*R. speciòsus*, Hort.). Plant from a true bulb, erect, about 1 ft. high, hairy: lvs. petioled, 3–5-parted, the divisions sometimes stalked; segments lobed: fls. terminating the branches, bright yellow, large; petals large, obovate, shining above; sepals much smaller, often reflexed: akenes compressed, with short beak, and borne in a globose head. Spring and summer. Persia, Eu., N. Africa.—The double form is perhaps best suited for cultivation.

6. **Sùksdorfii**, Gray. Roots fibrous: stems slender, 3–6 in. high, glabrous, radical and lowest stem-lvs. small, about 6–8 lines long, subreniform to broadly flabelliform, with truncate base, deeply 3–5-cleft or parted; divisions cuneate, again 2–5-cleft or incised; upper stem-lvs. with linear divisions: fls. 1–3, deep yellow; petals round-obovate, retuse: akenes turgid-lenticular, sharp-edged, glabrous;. style persistent for a time, slender, ¾ line long, equaling the akene body: head of fruit globular. July, Aug. Damp places, 6,000–8,000 ft. altitude; Mts. of Wash., Oreg. and Mont.—This rare species was offered by F. H. Horsford in 1889.

7. **Asiáticus**, Linn. Fig. 2077. Plant erect, either simple or branched, ½–1 ft. high: roots fleshy: lvs. petiolate, becoming sessile upwardly, ternate or biternate; segments toothed or deeply 3-lobed: fls. terminating the stems and branches, variable in color among the cultivated forms; calyx spreading, becoming reflexed; petals large, obovate, blunt: fr. in a spike. May, June. Asia Minor. F.S. 16:1679 (fl. pl.). R.B. 16:133 (var. *superbissimus*).—Highly bred double fls. of many kinds are in cult. Roots are sold as "bulbs." The Persian and Turban Ranunculuses belong here.

8. **orthorhýnchus**, Hook. Plant 10–18 in. high, erect, branched, hirsute to nearly glabrous: root thick, fibrous: lvs. oblong in outline, pinnately compound; lfts. 5–7, cleft and incised, quite variable; upper lfts. often confluent and sessile or nearly so, lower ones well stalked: petals 7–16, yellow, rarely purple beneath, obovate; sepals much shorter, pubescent beneath, reflexed, deciduous: akenes glabrous, obliquely ovoid, compressed, margined; style of same length, straight, rigid, persistent: head globose. May–July. Wet places, Brit. Col. to Ore. and Mont. – Var. **platyphýllus**, Gray (*R. máximus*, Greene). Often 3 ft. or more high: lvs. larger, 2–4 in. across; lfts. often 3 in. long, and laciniately cut: petals often larger than the type.

2077. Persian Ranunculus—R. Asiaticus (× ½).

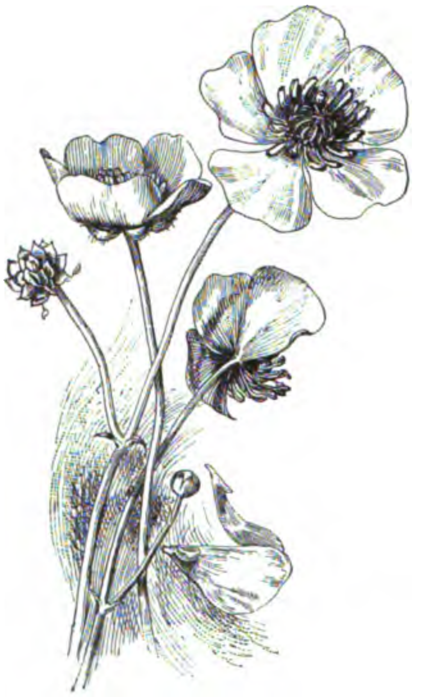
9. **cortusæfòlius**, Willd. Root of thick, fleshy, fasciculated fibers: plant velvety hairy, 1–3 ft. high: lower lvs. long-petioled, roundish to reniform, incised, and with cut and toothed lobes; stem-lvs. divided into 3–5 narrow lobes; upper ones sessile: fls. several or many, terminal and axillary, rather paniculate; sepals 5, ovate to lanceolate, green with pale margins; petals 5, large, broadly obovate, glossy yellow: akenes compressed, hairy on sides, tapering into recurved styles nearly their own length; head of fruit short-oval. May. Island of Teneriffe, Canary group. Int. 1893. Gn. 45:944. B.M. 4625. —Not very hardy and needs protection in winter and early spring. It is well suited for pot culture. It is increased by division of the roots in autumn.

UofM

10. **Califórnicus**, Benth. Plant rather weak, ½–2 ft. high, usually pubescent or hirsute, branching and without leaves in upper part: roots fibrous: lvs. ternately divided or parted, or palmately 5-divided into linear or narrow, often 2–3-parted divisions: petals 6–15, glossy yellow, oblong or narrowly obovate: akenes flat, slightly margined, beak very short. Rather dry places, W. Calif. and adjacent Ore.

11. **àcris**, Linn. Figs. 1874, 2074, 2075, 2078. Plant hairy up to the sepals, erect, ½–3 ft. high, often branched: radical lvs. on long, slender petioles; others with shorter petioles sheathing the stem or nearly sessile; lvs. 3-parted nearly to the base, the divisions ovoid-cuneate, 2–3-lobed and coarsely toothed or cut: bracts linear, lobed or entire: fls. yellow, 9–12 lines across, several, on rather short peduncles; sepals hairy beneath, ovate, shorter than the petals; petals 5, glabrous, obovoid, obtuse, bearing a prominent scale at base: akenes compressed, coriaceous on margins; style very short: head globose. May–Sept. Newfoundland, Canada, eastern states. Said to be naturalized from Europe.—Var. **flore-plèno**, Hort., is more common in cult. The best forms are deep, glossy, golden yellow and very double. Called BACHELOR'S BUTTONS. B.M. 215.

12. **aconitifòlius**, Linn. Plant pubescent, ½–3 ft. high, branched: lvs. palmately 3–5-parted, parts cut-toothed, upper ones sessile and with oblong to linear-lanceolate lobes: fls. white, several on a stem; sepals flat, pubescent; petals oblong, cuneate to orbicular. May, June. Mountains of middle Europe.—Var. **flore-plèno**, Hort. (var. *plènus*), called WHITE BACHELOR'S BUTTON and FAIR MAIDS OF FRANCE, has very ornamental, double, white, globose flowers. Gn. 45, p. 29, and 48, p. 506. Var. **lùteus-plènus**, Hort. Fls. much doubled but of a golden yellow color. The type and varieties are suited to borders and half wild places



2078. Buttercups—Ranunculus acris. Natural size.

R. anemonoìdes, Zahl. 6 in.: fls. white or tinged rose. Austria. Gn. 22:354.—*R. aquátilis*, Linn., sometimes called Lodewort, Ram's Foot, etc., is an interesting aquatic plant common in temperate regions, the floating lvs. often broad and 3-lobed, while the submerged lvs. are cut up into numerous thread-like segments.—*R. bullàtus*, Linn., is a yellow-fld. species offered in single and double forms by Dutch bulb dealers. Mediterranean region.—*R. cardiophýllus*, Hook., offered in Colo. in 1900, is considered by Gray as R. affinis, var. validus. It is an American species pictured in B.M. 2999 with yellow fls. 1¼ in. across.—*R. fasciculàris*, Muhl. Height 1 ft. June. N. Am. Mn. 2:1.—*R. Ficària*, Linn., called Lesser Celandine or Pilewort in England, is a native of Europe and the Caucasus region. It has yellow fls. about 1 in. across. A double form is procurable from Dutch bulb dealers.—*R. lanuginòsus*, Linn., is a European species of which a double form is advertised by Krelage, of Haarlem, Holland.—*R. Lỳallii*, Hook. f., the New Zealand Water Lily, grows 2–4 ft. high, has peltate lvs. and waxy white fls. 4 in. across, borne in many-flowered panicles. In Europe it is considered a cool greenhouse plant. It is a gorgeous species and ought to succeed somewhere in North America. G.C. II. 15:724; 23:371.—*R. parnassifòlius*, Linn., is a white-fld. European mountain plant 6 in. high, procurable from Dutch bulb dealers. J.H. III. 30:37. L.B.C. 3:245. B.M. 386.—*R. pedàtus*, Waldst. & Kit., a native of the Hungarian Alps, has yellow fls. nearly an inch across.—*R. rutæfòlius*, Linn., a native of the higher Alps, has yellow fls.: petals 8–10; claw orange Offered by Dutch dealers.—*R. septentrionàlis*, Poir., is advertised. It is a native plant allied to R. repens.—*R. spicàtus*, Desf., is figured in B.M. 4585, with showy 5-petaled yellow fls. fully 2 in. across. It is an Algerian species but is said to be perfectly hardy in England and of easy culture in any good garden soil.—*R. superbissimus*, Hort., is used in some catalogues for the double French Ranunculi, known also as R. Asiaticus, var. superbissimus.—*R. viridiflòrus*, Hort. Van Tubergen, is a scarlet and green-fld. variety of the Turban class of R. Asiaticus.

K. C. DAVIS.

2079. Dwarf Essex Rape (× 1-12).

RAPE (*Brassica Napus*). Fig. 2079. In recent years this has become an important forage plant. The name Rape includes several varieties which are grown for two purposes: (1) for seed from which oil is expressed; (2) for the purpose of furnishing animals with succulent feed during late summer and autumn, when pastures become bare. Varieties used for the latter purpose usually do not produce seed in this climate the same season, though they are usually classed with annuals. Dwarf Essex is an example of the kind used for soiling (green feeding) purposes. Rape is of considerable importance to the fruit-grower as a cover-crop. The seed germinates readily, will often grow where a clover catch is impossible, and furnishes excellent sheep pasturage late in the season. When grown strictly as a soiling plant the tops are cut and hauled to the feed-lot or stable. Dwarf Essex Rape much resembles a rutabaga turnip at first. It is like a rutabaga with an exaggerated leafy top and without a swollen fleshy root. Rape is a cool weather plant and may be grown in almost any part of the United States by sowing it at the proper time. As a cover-crop in the orchard in the East it may be sown as late as September 15 with good results. It is an excellent pioneer plant in the work of renewing humus in worn-out lands. In the Middle West, where shade is needed, Rape is used as a nurse plant for clover when the latter is sown in orchards in midsummer. Turnips may be used for the same purpose.

JOHN CRAIG.

RÁPHANUS (classical name, from the Greek). *Cruciferæ*. RADISH. CHARLOCK. Annual or biennial branching herbs, of about 6 species in Europe and temperate Asia, of which one, *R. sativus*, is the Radish (which see). They bear small but rather showy slender-pedicelled flowers in rose-lilac or white, or in some species yellow, in open terminal racemes. Leaves various and variable, the radical and sometimes the cauline lyrate-pinnatifid. Stamens 6, free. Sepals erect, the lateral ones somewhat saccate or pouch-like at base. Pod a

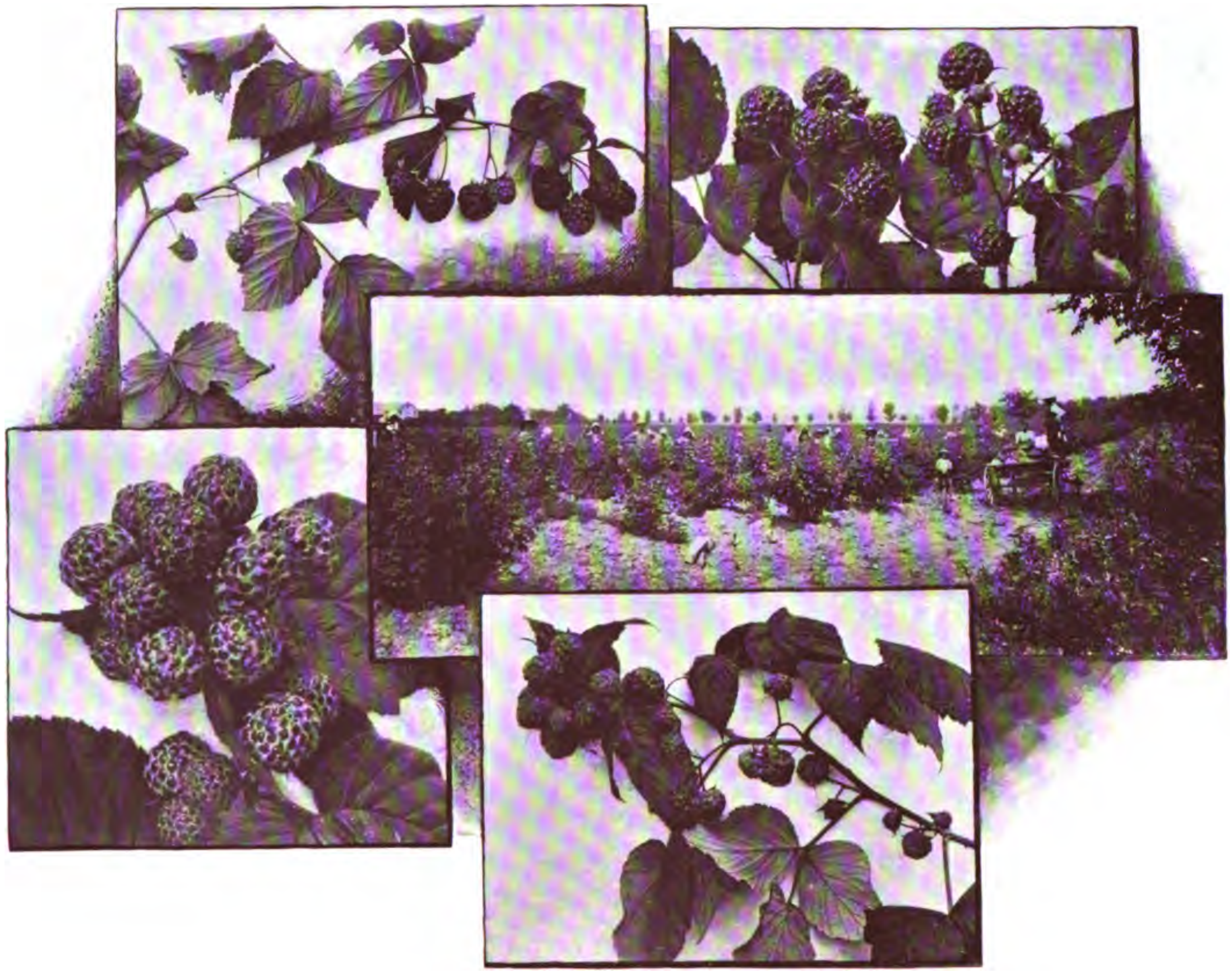


Plate XXXIII. Raspberries.

Center, commercial Raspberry field in New York; top left, *Rubus strigosus*, the Wild Red Raspberry; top right, *Rubus occidentalis*, the Wild Black Raspberry; lower left, *Rubus occidentalis*, improved, of same relative size as the picture of the wild; lower center, *Rubus neglectus*, hybrid of the Red and Black.

long cylindrical fleshy or soft-corky silique, with spongy tissue between the globose seeds, indehiscent. The genus is divided into two natural groups, one (Raphanistrum) with the pod longitudinally grooved and constricted between the seeds, the other (Raphanus proper) with the pod not grooved nor prominently constricted. To the former group belongs **R. Raphanistrum**, Linn., the Jointed or White Charlock (sometimes, but erroneously, known as **Rape**). It is an Old World annual weed, now naturalized in fields and waste places in the easternmost states. It is an erect, sparsely hairy herb, with slender tap-root and radish-like lvs., growing 2–3½ ft. high: fls. rather showy, yellowish, turning white or purplish: silique 1–3 in. long, few-seeded, with a long beak. It is from this species that Carrière produced Radishes by means of plant-breeding (see *Radish*). To the second section belongs **R. sativus**, Linn., the Radish, generally considered to be native to Europe and Asia, but unknown in an aboriginal wild state. It is usually an annual, although commonly spoken of as biennial, because the roots can be kept over winter and planted the following spring. The winter Radishes are truly biennial in northern climates. Radish has pink-lilac or nearly white fls., and short, thick, spongy, taper-pointed pods. Sometimes it runs wild in waste places, and then bears a long, hard tap-root like that of *R. Raphanistrum*. The Radish is extensively cultivated for its thick roots, which have been developed into many shapes and colors. There are Chinese types of Radish that have a hard root little more than 1 in. in diam., and sometimes becoming nearly 1 ft. long. Some forms are scarcely distinguishable from short turnips. The **Madras Radish** (India) is grown for its soft, tender pods, which are eaten raw or in pickles. The Rat-tailed or Serpent Radish, var. **caudàtus** (*R. caudàtus*, Linn.), has enormously long pods (see Fig. 2066), which are eaten either pickled, or raw as Radish roots are. Frequently the pods are 1 ft. long. The root is slender and hard. This is a cultural variety, coming true from seed.

L. H. B.

RAPHIA. See *Raffia*.

RAPHIDÓPHORA. See *Rhaphidophora*.

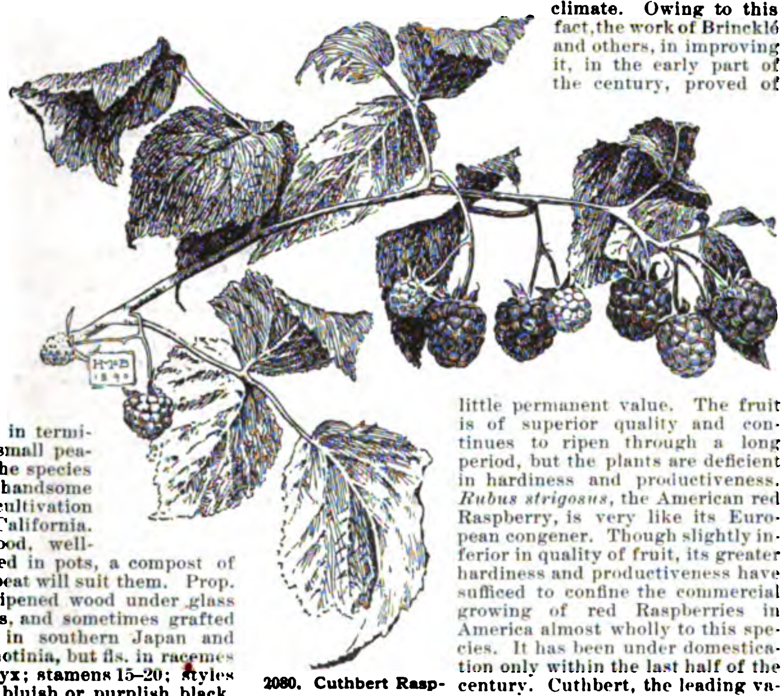
RAPHIÓLEPIS (Greek, *raphis*, needle, and *lepis*, scale; referring to the subulate bracts). Sometimes spelled *Rhaphiolepis*. *Rosàceæ*. Ornamental evergreen shrubs, with alternate or obscurely whorled, usually serrate lvs., white or slightly pinkish fls. in terminal racemes or panicles and small pea-sized black fruits. None of the species are hardy north, but all are handsome broad-leaved evergreens for cultivation in the southern states and California. They will thrive in any good, well-drained soil, and if cultivated in pots, a compost of sandy loam and leaf-mold or peat will suit them. Prop. by seeds or by cuttings of ripened wood under glass late in summer; also by layers, and sometimes grafted on hawthorn. Two species in southern Japan and China, allied to Sorbus and Photinia, but fls. in racemes or panicles, with deciduous calyx; stamens 15–20; styles 2–3, connate below: fr. small, bluish or purplish black, bloomy, with one globular seed.

Japónica, Sieb. & Zucc. (*R. ovàta*, Briot). Shrub, to 12 ft., with stout, upright branches: lvs. short-petioled, broadly oval or obovate, obtuse or acutish, narrowed at the base, crenate-serrate, dark green and lustrous above, pale beneath, floccose-tomentose when young, thick, 1½–3 in. long: fls. white, ¾ in. across, fragrant, in dense, tomentose panicles or racemes; petals obovate, obtuse: fr. to ⅓ in. across. May, June. S. Japan and adjacent islands. S.Z. 1:85. R.H. 1870, p. 348. Gn. 22, p. 43; 32, p. 20; 34, p. 158.—Var. **integérrima,** Hook. Lvs. entire or nearly so, to 3½ in. long. B.M. 5510.

Índica, Lindl. (*R. rùbra*, Lindl. *Cratægus Indica*, Linn.). INDIAN HAWTHORN. Shrub, to 5 ft., with slender, spreading branches: lvs. obovate to oblong-lanceolate, acute or acuminate, gradually narrowed at the base, serrate, glabrous or slightly pubescent when unfolding, 1½–2½ in. long: fls. white or pinkish, about ⅓ in. across, in glabrous or somewhat tomentose, rather loose panicles; sepals lanceolate, acute, usually red like the filaments; petals acute: fr. ¼–⅓ in. across. May, June. S. China. B.M. 1726. B.R. 6:468; 17:1400. —A very variable species; several forms have been described as distinct species, as *R. Phæostemon*, *rubra* and *salicifolia*, Lindl. The last named, which is var. **salicifòlia,** Nichols., is the most ornamental: lvs. oblong-lanceolate, acuminate: panicles rather large and many-fld.; stamens white or purplish, shorter than sepals. B.R. 8:652. R. H. 1874:270. Gn. 9:26. *R. rubra*, advertised by the S. Calif. Acclim. Asso., is *Pyracantha crenulata*, which see. A hybrid between the two species is *R. Delacoùrii*, André, forming a compact shrub with rather large panicles of blushed fls. and the foliage intermediate between the two parents. R.H. 1900:698.

ALFRED REHDER.

RASPBERRY is a name applied to those brambles in which the fruit separates from the receptacle when ripe. Plate XXXIII. Three species are of importance in American fruit-growing. *Rubus Idæus*, the European Raspberry, has been longest in cultivation and is least important now in this country. Though brought to America by our forefathers among their earliest fruits, and the parent of many varieties here produced, the species has never fully adapted itself to the American climate. Owing to this fact, the work of Brincklé and others, in improving it, in the early part of the century, proved of little permanent value. The fruit is of superior quality and continues to ripen through a long period, but the plants are deficient in hardiness and productiveness. *Rubus strigosus*, the American red Raspberry, is very like its European congener. Though slightly inferior in quality of fruit, its greater hardiness and productiveness have sufficed to confine the commercial growing of red Raspberries in America almost wholly to this species. It has been under domestication only within the last half of the century. Cuthbert, the leading variety, is shown in Figs. 2080, 2081. *Rubus occidentalis*, the black Raspberry, is commercially the most important Raspberry in the United States at the present time. It lends itself readily to cultural methods, the plant is hardy and productive and the fruit is better able to meet the exigencies of market demands, though relished less by most persons, than that of the reds. The growing of black-caps in field culture for evaporating has added greatly to the importance of the species. This can be done where

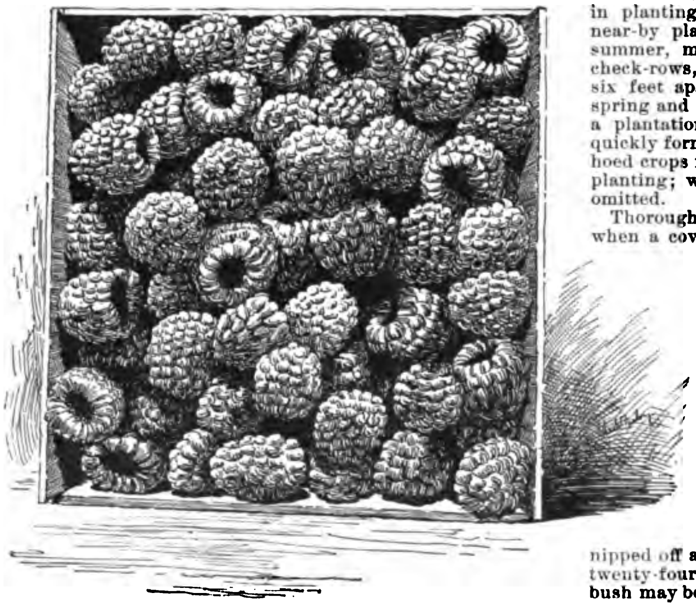


2080. Cuthbert Raspberry (× ⅓).

To show habit of fruit-bearing.

conditions would not warrant the growing of fruit to be sold fresh. Hybrids of *R. strigosus* and *R. occidentalis*—known as *R. neglectus*—have given the purple-cane class, of which Shaffer (Fig. 2082) is a leading example. For further notes on species of Raspberry, see *Rubus*.

Raspberries are extensively grown in the northeastern states. They thrive best in deep, moist soil. The lighter loams are preferable for reds and the heavier loams for blacks. The prime essential is that the land shall be able to withstand drought well; but it must not be over-wet. Much may be done to improve the drought-resisting quality of soils. If the subsoil is hard and impervious it may be improved by underdraining or subsoiling. This will provide a deeper reservoir for the storage of moisture. Still more important is the proportion of vegetable matter. A soil rich in humus admits water more readily and in larger quantities, retains it longer and therefore resists drought better than one that is deficient in humus. Humus may be increased by the application of stable manure and by plowing under green crops, but the process must be gradual. Undecayed vegetable matter is not humus, and its addition in large quantities may augment the difficulty which the increase in humus is designed to correct. Thorough soil preparation must therefore begin several years previous to planting, if the land has been improperly handled theretofore. Other important offices of humus are the holding of nitrogen to prevent its loss, and the unlocking of mineral elements from the soil. The well-known fact that brambles thrive so well in virgin soil, is, no doubt, largely due to the abundance of humus which such soil contains.


2081. Box of Cuthbert Raspberries (X ⅛).

Stable manure is permissible as a fertilizer, except for red Raspberries when growing on moist, rich soil, in which case it forces growth too much. Leguminous crops may furnish all the nitrogen needed. Floats, ground bone or basic slag will supply phosphoric acid, and potash may be obtained from wood ashes or muriate of potash. Upon the soil of the Rhode Island Experiment Station, which is a light sandy loam with gravelly subsoil, the addition of nitrogen does not increase the yield, although the soil is not naturally fertile and nitrogen has been applied annually for a series of years. Other crops have been upon the land until recently. Even plots from which mineral elements have also been omitted do not fall far behind those which have been liberally dressed with the three essential fertilizing elements for a series of years, judging from the first crop only. No one can tell the grower how to fertilize his plants; the question must be settled upon his own farm. Cover-crops have not been extensively used, but are likely to receive more attention. Where crimson clover will thrive it is well adapted to the purpose, although somewhat difficult to uproot in spring.

Planting may be done in fall or spring, but spring is to be preferred for black-caps. Plants secured from young plantations are preferable, since they possess greater vigor and are less likely to carry disease. The individuality of the parent-plant, while generally disregarded, may be a determining factor in the profitableness of the offspring. Black-cap plants are obtained by burying the tips of the growing canes, late in summer, when they begin to thicken and throw out roots. When thoroughly rooted, the layer is severed and the "tip" (Fig. 2083) is used for planting. Reds throw up numerous suckers from the roots and these are oftenest used in planting, though root-cuttings are available. For near-by planting the young suckers, moved in early summer, may be used. Plants are preferably set in check-rows, six or seven feet apart, with plants four to six feet apart in the row. Cross-cultivation in early spring and after fruiting will materially aid in keeping a plantation in good condition. Without it the reds quickly form thick hedge-rows. With intensive methods hoed crops may be grown between the rows the year of planting; with common farm methods they are better omitted.

Thorough tillage should be given till midsummer, when a cover-crop should be sown. In especially dry climates, as upon the Plains, tillage should be continued throughout the season. Plowing between the rows in spring is undesirable and is unnecessary if tillage has been good the previous year. With reds some form of cultivator with square-pointed teeth or cutting-blades is advantageous in destroying suckers.

Tender varieties may be protected in winter by laying them down and covering them with earth. To do this loosen the soil at one side of the root and bend the plant in that direction. The plants are usually bent in the direction of the row so that the tops will lap over the crowns.

The young shoots of black-caps should be nipped off as soon as they reach a height of eighteen to twenty-four inches, that a well-branched self-supporting bush may be obtained. In spring following, the branches should be shortened to one to two feet. This spring pruning is the fruit-thinning process of the year and should be done with judgment. The poorer the soil or the less able it is to withstand drought, and the less intensive the culture, the more severe should the pruning be. Anthracnose may give less trouble, and the plantation will last longer, without summer pinching, but the yield will be much lower. With reds summer pinching is undesirable after the year of planting, unless with exceptionally vigorous varieties on strong soil. The older canes are best removed as soon as fruiting is over. They are more easily cut then and their removal gives a good opportunity for cross-cultivation (in case the check-row system is used) and a thorough cleaning-up before the season's tillage is abandoned. Early removal may also help to check the spread of certain enemies. Plantations may be kept in bearing many years if desired, but it is seldom profitable to do so.

The fruit demands care in picking and in handling thereafter. It should never be picked when wet. Red raspberries are especially difficult to ship and are usually marketed in pint baskets rather than quarts. Reds yield less than blacks and usually sell at a higher price.

Enemies are numerous. Crown- and cane-borers must be controlled by cutting out and destroying the infested canes. Red rust sometimes sweeps away plantations of black-caps. A plant once attacked can never be cured and should be rooted out and burned at once. Anthracnose is especially troublesome. Only plants free from it should be set, and the plantation should be abandoned before it becomes badly diseased. Spraying will reduce it but is not entirely satisfactory. Crown-gall, due to the growth of a specific organism of a very low order, belonging to the slime-molds, is often serious, particularly with reds. Neither affected plants nor apparently healthy ones from a diseased lot should be planted, as the trouble is readily communicated to other plants and trees.

2082. Shaffer Raspberry—Rubus neglectus (× ¼).

Fred W. Card.

RAT-TAIL CACTUS. *Cereus flagelliformis.*

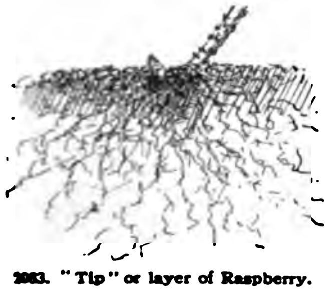
RATTAN. See *Calamus.*

RATTLE-BOX. The species of *Crotalaria;* also *Ludwigia alternifolia.*

RATTLESNAKE WEED. See *Hieracium venosum.*

RATTLESNAKE PLANTAIN. *Goodyera.*

RATTLESNAKE ROOT. *Prenanthes.*


2083. "Tip" or layer of Raspberry.

RAUWÓLFIA (Leonhart Rauwolf, physician of Augsburg, published a book in 1583 on his travels in the orient; often erroneously stated to be of the eighteenth century). *Apocynaceæ.* About 40 species of tropical trees and shrubs with lvs. in whorls of 3 or 4, rarely opposite, and small fls. often borne in dichotomous or trichotomous clusters. Calyx 5-cut or 5-parted; lobes obtuse or acute: corolla funnel-shaped; tube cylindrical, dilated at the insertion of the stamens, usually constricted at the throat, devoid of scales; lobes 5: disk cup-shaped or ring-shaped: carpels of the ovary 2, distinct or considerably grown together: style short or long: ovules in each carpel 2: drupes 2, distinct or connate into a 2-stoned fruit, the stones 2-grooved or 2-cut: stones 1-seeded: seeds ovate; albumen fleshy, smooth, not ruminate, rarely wrinkled. These plants are little known horticulturally. The only species in the American trade, apparently, is *R. Chinensis*, Hort. Several years ago the undersigned received from the Botanical Garden at Hong Kong a few seeds of this small evergreen shrub. The seeds germinated well and the plants grew rapidly, attaining a height of about a foot in a year. During the summer of the second year the rather bushy plants flowered well and bore a crop of shining red berries which were very conspicuous throughout the winter. When well grown and bushy the plant is quite ornamental, its habit being dense and the color of its leaves dark green. The flowers are white, and are borne in dense trusses at the extremity of each shoot. Though an individual flower does not make much show, the plant is very ornamental when covered with masses of blossoms. The plant needs a rich, light soil, much water when in full growth and protection against the fierce rays of the sun. Every spring the old soil should be shaken out and replaced by a rich compost. In the writer's garden at Gotha, Orange county, Florida, the Rauwolfia flourishes with great luxuriance in the shade of other shrubs in rather moist spots. Although it is easily winter-killed, it sprouts readily in spring from the roots. When covered with numerous trusses of shining red berries the plant is an object of beauty.

H. Nehrling.

RAVENÀLA (the name of the plant in Madagascar). *Scitamineæ.* A genus of 2 species, 1 from Brazil and Guiana and 1 from Madagascar. Musa-like plants becoming 20–30 ft. high, with a palm-like trunk: lvs. exceedingly large, crowded in 2 ranks, thus forming a fan-shaped head of foliage; petioles long, with concave bases scarcely sheathed: scapes or peduncles in the upper axils longer or shorter than the leaves: bracts spathe-like, many, boat-shaped, acuminate; fls. many, large, in a spathe or bract; petals long-exserted; sepals free: fr. a 3-valved capsule.

A. *Lvs. shorter than petioles.*

Madagascariénsis, J. F. Gmel. Travelers' Tree, so called from the clear watery sap found in the large box-like cells of the leaf-stalks and which affords a refreshing drink. Fig. 2084. Lvs. often 30 ft. high, musa-like, very large, fibrous: fls. white, in spathes about 7 in. long. Gng. 5:153. V. 23, p. 136. F.S. 21:2254. A.F. 12:535. R.H. 1890, p. 152. G.C. III. 2:693. A.G.

2084. Travelers' Tree—Ravenala Madagascariensis.

20:870.—Cult. in Fla. and S. Calif.; also rarely under glass in the northern states.

AA. *Lvs. as long as the petioles.*

Guyanénsis, Steud. Becoming 15 ft. high: lvs. oval-elongated: fls. white: spathes 1-1½ ft. long. Offered 1893 in S. Fla.

F. W. Barclay.

RAVÈNEA. See *Ranevea.*

RAVÈNIA (name not explained). *Rutàceæ.* A genus of 2 species of tender shrubs from Cuba and Brazil: lvs. opposite, 1-3-foliolate; lfts. lanceolate, entire: fls. red or white, borne on rather long axillary peduncles; sepals unequal, the 2 outer being somewhat foliaceous; corolla-tube straight, rather long; the limb nearly regular.

spectábilis, Engl. (*Lemònia spectábilis*, Lindl.). Tender shrub: lfts. 3: fls. purplish red, about 1 inch across, solitary or in open, few-fld. clusters on axillary peduncles as long as the lvs. Cuba. B.R. 26:59. R.H. 1844:25.—The plant offered in Fla. as *Lemonia spectabilis* apparently belongs to some other genus.

F. W. Barclay.

RAY GRASS. *Lolium perenne.*

REÀNA. Consult *Teosinte.*

RED BAY, *Carolina.* **Red Bud.** See *Cercis.* **Red Campion,** *Lychnis dioica.* **Red Cedar,** *Juniperus Virginiana.* **Redhead,** *Asclepias Curassivica.* **Red-hot Poker Plant,** *Kniphofia.* **Red Morocco,** *Adonis autumnalis.* **Red Osier,** *Cornus stolonifera.* **Red Pepper,** *Capsicum.* **Red Robin,** *Geranium Robertianum.* **Red-root,** *Ceanothus Americanus; Lachnanthes.* **Red Spider.** See *Insects.* **Redtop.** See *Agrostis.* **Redwood,** *Sequoia;* also *Ceanothus, Pterocarpus,* etc.

REED. See *Arundo* and *Bamboo.* **Reed Canary Grass** is *Phalaris arundinacea.* **Reed Mace** or **Cat-tail** is *Typha.*

REED, INDIAN. See *Canna.*

REEVÈSIA (John Reeves, English botanist, who resided for a time at Canton). *Sterculiàceæ.* A genus of 3 species of trees from tropical Asia, with coriaceous, entire leaves and terminal corymbose panicles of white fls. Calyx club-shaped or campanulate, irregularly 3-5-lobed; petals 5, oblong, furnished with a claw; staminal column long, adnate to the gynophore; anthers 15, sessile, in a globular head: ovary 5-loculed, usually 10-seeded: capsule woody: seeds winged.

thyrsoidea, Lindl. A small, glabrous tree: lvs. evergreen, 2-6 in. long, petioled, ovate-lanceolate to lanceolate, entire, rounded at base: fls. white, in terminal, sessile corymbs shorter than the lvs.; calyx 3 lines long; petals somewhat longer: capsule oblong-pear-shaped, 1 in. long, 5-angled. China. B.M. 4199. B.R. 15:1236.—Cult. in S. Calif.

F. W. Barclay.

REINÉCKIA (J. Reinecke, a German gardener). *Liliàceæ.* A genus of a single species from China and Japan, a tender perennial herb, with attractive foliage in tufts 1-1½ ft. high from a thick, creeping rootstock. Lvs. rather long, channeled: scapes leafless: fls. sessile, in a loose spike; perianth-tube cylindrical; lobes recurved, spreading: ovary 3-loculed, with a few seeds to each cell: berry globular, usually with one seed to each cell. The following is procurable from Dutch bulb-growers.

cárnea, Kunth. Fls. dull flesh or pink: bracts rather large, tinted red: fr. red, 3-4 lines in diam. B.M. 739. —Var. **variegàta** is also offered. I.H. 9:323.

REIN ORCHIS. *Habenaria.*

REINWÁRDTIA (Kaspar Georg Karl Reinwardt, 1773-1822, scientist of Leyden; traveled in East Indies 1815-1822). *Lindceæ.* A genus of two species of sub-shrubs from India with handsome yellow, 5-petaled fls. borne in midwinter. They are old favorites in conservatories. They require warmhouse treatment. The genus is closely allied to the flax (Linum), and *Reinwardtia trigyna* is known to this day as *Linum trigynum* by the gardeners, who usually accent trigynum on the second syllable instead of the first. Reinwardtia is distinguished from Linum by the yellow fls., 3-4 styles and unequal or deficient glands; Linum has mostly blue, rosy or white fls., 5 styles, and equal glands. Other generic characters: sepals 5; petals 5, contorted, fugacious; stamens 5, alternating with as many staminodes; glands 2-3, adnate to the staminal ring: ovary 3-5-loculed.

Reinwardtias are showy subshrubs about a foot high with bright yellow flowers. They are useful for the decoration of the conservatory in winter time, at a season when yellow is scarce. To have presentable plants, it is necessary to give them a good deal of attention. It is difficult sometimes to get suitable cuttings; the strong growths which start away from the base when the plants are cut down make the best plants. Top-shoots will grow, but seldom make good plants, as they are liable to go to bloom prematurely. Sandy loam is the best compost. Plants that have been grown in pots for a season may be planted out in the early summer, and these will make good plants and furnish cuttings. They will have to be topped frequently and carefully lifted. Young stock is better kept in pots, as the plants do not lift well. Sunshine is essential during the winter season to get the best development of Reinwardtias. They thrive best in a temperature of 55-60°.

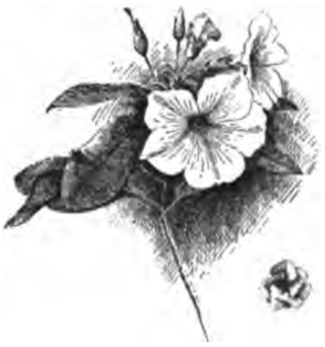
A. *Lvs. entire: styles 3.*

trigyna, Planch. Fig. 2085. Lvs. elliptic-obovate, entire or minutely toothed, tip rounded or subacute. B.M. 1100. Gn. 29, p. 279.—Grows 2-3 ft. high in the wild.

AA. *Lvs. toothed: styles 4 or 3.*

tetrágyna, Planch. Lvs. elliptic-lanceolate, acuminate, crenate-serrate. B.M. 7136. G.C. III. 16:721. R.H. 1867:291.

T. D. Hatfield and W. M.



2085. Reinwardtia trigyna (× ½).

RENANTHÈRA (named from the reniform anther). *Orchidàceæ.* Tall, climbing epiphytes, with branched stems sometimes 12-14 ft. high: lvs. distichous on the stem: fls. in large, drooping racemes or panicles; sepals and petals spreading, similar or the lateral sepals often larger and of a different color; labellum small, movably joined to the column, spurred or spurless, often with small, erect, lateral lobes. Culture is similar to that of Ærides and Vanda.

coccinea, Lour. Stems 8-10 ft. high, branched, climbing by means of white fleshy roots: lvs. in 2 rows, oblong, notched at the end, 4-5 in. long: fls. open, 2-3 in. across, in loose, branching racemes 2-3 ft. long, very brilliant; petals and dorsal sepal linear-spatulate, deep red, blotched with orange; lateral sepals larger, oblong, broader toward the apex, undulate, deep crimson, with paler transverse lines; labellum small. Autumn. Cochin-China. B.M. 2997, 2998. B.R. 14:1131. P.M. 4:49. F.S. 7, p. 163. G.C. 1845:491.—Does not flower readily in cultivation, but is very showy.

Stòriei, Reichb. f. Stem slender, climbing, 10–12 ft. high: lvs. alternate, oblong to linear-oblong: panicle about 1 ft. long and nearly as broad: fls. 2½–3 in. long; petals and dorsal sepal erect, linear-spatulate, orange-red, mottled with crimson; lateral sepals pendulous, obovate-spatulate, undulate, crimson with large blood-red blotches; labellum very small. Philippines. B.M. 7537. Gn. 53, p. 119. G.M. 39:659.

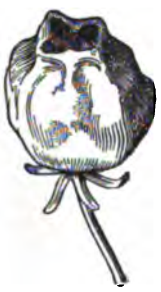
Lòwei, Reichb. f. (*Vánda Lòwei*, Lindl.). Fig. 2086. Stems very long, climbing, somewhat branched: lvs. rather crowded, strap-shaped, 2–3 ft. long: racemes from the upper axils, 6–12 ft. long, bearing 40–50 fls.: fls. of two kinds, the lowest pair tawny yellow with crimson spots, the others larger, pale yellowish green, irregularly blotched with reddish brown; sepals and petals lanceolate, acute, undulate, on the lowest pair shorter, blunter and more fleshy. Borneo. B.M. 5475. I.H. 11:417. R.H. 1868:110; 1884, p. 343. F.S. 21:2256. Gt. 37, pp. 108, 109. Gn. 11, p. 524; 16, p. 354, 355; 32, p. 197. G.C. II. 20;657; III. 27:3.—A very remarkable orchid.

HEINRICH HASSELBRING.

RESÈDA (from the Latin *to calm;* said to allude to supposed sedative properties). *Resedàceæ.* MIGNONETTE. The family Resedaceæ includes between 60 and 70 species of small, not showy plants, mostly herbs, widely distributed in warm-temperate regions. These species fall into 6 genera, of which only Reseda is cultivated to any extent. This genus contains 53 species (Muller, DC. Prodr. 16, pt. 2), most of which are native to the Mediterranean basin, Arabia and Persia. They are herbs (sometimes partially woody at the base) with alternate, simple or compound lvs., and terminal spikes of inconspicuous perfect flowers. The flowers have 4–7 small greenish toothed or cleft petals and 8–40 small stamens; pistil 1, ripening into a 3–6-horned capsule that opens at the top at maturity (Fig. 2087), and contains several to many seeds. Only one species, the common Mignonette (*R. odorata*), is generally known, but two or three other species are sometimes grown. Two other species are occasional weeds in the East,—*R. Lutèola*, Linn., the Dyer's Weed, 1–2 ft. tall, with entire lvs., 4 or 5 greenish petals of which the lowest one is entire; and *R. lùtea*, Linn., with pinnatifid lvs. and petals usually 6.

A. *Lvs. entire or only notched.*

odoràta, Linn. COMMON MIGNONETTE. Figs. 1401, Vol. II, 2087. Branching annual herb, at first upright but becoming wide-spreading and more or less decumbent: lvs. spatulate or oblanceolate, mostly obtuse, usually entire but sometimes notched: fls. yellowish white, in spicate racemes that become loose and open with age, very fragrant. N. Africa, Syria. B.M. 29. Gn. 55, p. 409.—Much grown for its strong and agreeable fragrance. It has been greatly modified under domestication. The following garden names seem to belong to this species: *ameliorata, compacta, eximia, gigantea, grandiflora, multiflora, pumila.* Var. **suffruticòsa,** Edw., is woody at the base. B.R. 3:227. Forty to 50 named varieties of *R. odorata* are in the trade. See *Mignonette.*



2087. Pod of Reseda odorata (× 2).

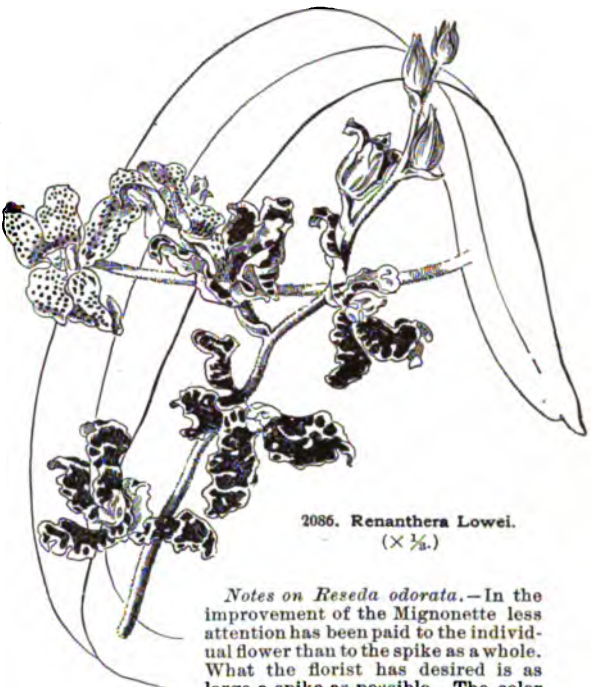
glaùca, Linn. Glabrous and somewhat glaucous perennial, less than 1 ft. tall, with many spreading stems: lvs. narrow-linear, entire, or 2-toothed near the base: petals 5 or 6, the upper ones 3-lobed; stamens about 14. Pyrenees.—Recommended for dry places, as a border plant. See p. 737.

AA. *Lvs. usually prominently lobed or pinnatifid.*

àlba, Linn. (*R. suffruticòsa*, Loef.). WHITE UPRIGHT MIGNONETTE. Fig. 2088. Straight-growing erect glabrous annual or biennial plant, 1–3 ft., weedy: lvs. numerous, long-stalked, deeply and irregularly pinnatifid, the segments usually linear and sometimes toothed: fls. white, in a very long, slender spike. S. Eu. G.C. III. 20:45.—A good plant for growing as an ornamental subject in the flower border with other plants. It bears many spikes on tall branches, making it a conspicuous plant. Treated as a half-hardy annual. Odor not pleasing.

crystallina, Webb. Glabrous, sparingly branched, somewhat glaucous annual: lvs. usually 3-parted, or the lowest ones entire: fls. deep yellow, in racemes. Canary Islands.—Has been offered as a garden annual.

L. H. B.



2086. Renanthera Lowei. (× ⅓.)

Notes on Reseda odorata.—In the improvement of the Mignonette less attention has been paid to the individual flower than to the spike as a whole. What the florist has desired is as large a spike as possible. The color and form of the flower and habit of the plant were secondary in importance when compared to size and abundance of spikes. Under such circumstances we can expect comparatively little change to have taken place in the individual flower. In fact, we find that all the floral parts, with the exception of the color and size of the anthers, have changed little. In the double-flowering varieties, the character of the flower has been changed by the replacement of the stamens with petal-like organs. In some cases traces of the anthers still remain. These double varieties are usually characterized by the smallness of their spikes, the pungency of their odor (being in some cases even unpleasant), and the tendency of the flowers to produce monstrosities. In the more improved varieties, and especially in those plants that have been highly fed, the size of the flowers is sometimes considerably larger than in the average specimen. The average size of the individual flowers is undoubtedly larger in improved varieties than in the unimproved varieties; this increase in size is no peculiarity of the petals alone, but is shared by all parts of the plant alike.

The peculiar and characteristic fragrance for which the Mignonette is chiefly cultivated has undergone marked changes during the improvement. It is stated by some writers that the odor of the old garden form was sweeter than that of the more improved forms. This seems to be true. All questions of odor, however, must be left to the discrimination of the individual observer. The old garden form has a sweet, pleasant odor, which is not so strong as that of the improved varieties but has a more penetrating and yet a light and agreeable quality. It reminds one somewhat of the wild sweet-scented blue violets. Philip Miller compared it to the odor of ripe raspberries. The odor of such improved varieties as Allen Defiance, White Diamond, Urania, etc., is heavy, strong and less delicate than that of the old forms. It reminds one, when the flowers are fresh, more of the fragrance of ripe nectarines or apricots than of violets. It is only after the spikes have been picked and begin to wilt that one recognizes the sweet violet-like scent. The modern improved varieties are likely to have very little scent when forced or fed high, and in cases of excessive forcing they become nearly or quite scentless. But if we let them wilt slightly, or on sunny days after the moisture has dried up, the powerful odor becomes very apparent. The old forms seem to have the power of volatilizing the ethereal oils freely under normal conditions, while the more highly bred only attain this power, to its fullest extent, when the root pressure is reduced.

2088. Reseda alba.

Gardeners frequently assert that Mignonette if grown in given kinds of soil will be less fragrant than when grown in certain other soils. Thus Henderson, in his "Handbook of Plants," states that "Mignonette should always be grown in light, sandy soils, if possible; as when grown in a rich loam it loses its fragrance." To test this matter, a number of plants of the same variety (Improved Victoria) were grown in soils varying in proportion of sand and clay and amount of manure as follows: Soil 1. 3 parts sand, ½ loam, ½ dung, ¼ mortar; Soil 2. 2 sand, 1 loam, ½ dung; Soil 3. 1 sand, 2 loam, 1 leaf-mold; Soil 4. 1 sand, 2 loam, 1 mortar, 1 dung; Soil 5. 2 loam, 1 mortar, ½ dung; Soil 6. Clay loam with some dissolved bone, $NaNO_3$ and charcoal; Soil 7. Loam, clay and K_2SO_4 $(NH^4)_2 SO_4$, P_2O_5 and charcoal. The plants varied considerably in the rapidity and amount of their growth. The difference in fragrance was difficult to estimate on account of the difference in the state of maturity of the various spikes. By making independent estimates on different days as long as all the plants were in bloom and trying to strike an average, the conclusion was reached that the plants grown in the lighter soils had a stronger and more pronounced fragrance than those grown in the heavy clay soils. The amount of fragrance given by wilting flowers on the heavy clay soils is very perceptibly less than that given off by flowers from the lighter soils. In plants grown in a heavy clay loam richly manured, the fragrance was hardly perceptible and very faint even on wilting. The influence of the different proportions of manure and soil used was not measurable, as the difference, if any, in the strength of the odor given off by the different spikes was too slight to measure.

Heavy manuring seems to have a deleterious effect on the fragrance of Mignonette. Two plots of the same number of plants growing in a solid bed were taken. One was manured weekly with liquid manure; the other was left unmanured. The manured plants made more growth and produced less but larger flowers than the unmanured plants. As long as the manuring was continued, the unmanured plot was the most fragrant. After discontinuing manuring for two weeks, the difference became imperceptible and ultimately the plot which had been manured became more fragrant than the unmanured plot. The plants in the unmanured plot were first to bloom.

It has been asserted that Mignonette is most fragrant when grown at a low temperature, it being a plant which loves a cool atmosphere. In order to test the effect of temperature on the fragrance of Mignonette, plants of the same varieties were grown in houses whose mean temperature was 50° F., 65° F. and 75° F. The plants had the same soil. Those in the house whose temperature was 50° were grown in flats and benches, while those in the other two houses were grown in 5-inch pots. All were sown November 16. Those in house of 75° germinated two days ahead of those in house of 65° and three days ahead of house of 50°. In relative amounts of growth the plants stood as follows (May 15): Hot house, first; cold house, second; medium, third. But in fragrance they stood as follows: Medium house, first; hot, second; cold, third,—until the outside temperature became high enough to raise the temperature of the cool house to that of the medium house (steam being off), when the plants in the cool house began to equal if not surpass those of the medium house in fragrance. At certain stages of the spike-development, the fragrance seemed stronger in the hot house than in the medium house, but did not last nearly as long as in the medium house. The cool house surpassed both in lasting power of the fragrance, due to the spike lasting longer and not volatilizing its ethereal oils so fast. The fact that the plants grown in the cool house were less fragrant at first than those grown in the warmer houses brought up the question whether this difference in fragrance was permanent or temporary and dependent on the temperature in which the plant was blooming at the time. Plants were taken from the cool house to the temperate (65°) house and left there for some time, with the result that after a time no difference in the fragrance between the cool house plants and those grown in the medium house could be detected, although there was a difference at first. Plants taken from the temperate house into the cool house, on the other hand, apparently did not lose their fragrance until the old spikes had been replaced by new ones. From these two results it would appear that the influence of temperature is not permanent either as far as the flowers that came immediately under the temperature influence is concerned or those flowers that are not yet developed. But the temporary influence of temperature is of longer duration in the case of flowers taken from a warm house into a cool house than from a cool house into a warm house. The difference in odor between plants grown in a warm and a cool house is probably due to the more ready volatilization of the ethereal oils in a warm temperature. This volatilization, when once set up, is probably less easily checked or accelerated above a normal rate, whatever that rate may be; hence the tardiness of the plants to react with the cooler temperature.

R. L. Junghanns.

REST HARROW. *Ononis rotundifolia.*

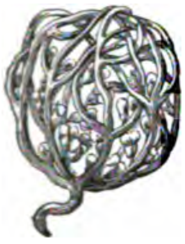
RESTRÈPIA (Joseph Emanuel Restrep, a student of natural history in the tropics). *Orchidàceæ.* A genus of very interesting little plants, allied to Masdavallia and not unlike that genus in habit and appearance. The stems are tufted on creeping rhizomes, each bearing a single leaf and clothed below with scales. The flower-stems appear from the axil of the leaves. They are perennial, producing flowers for several years in succession. Dorsal sepal free, ending in a filiform, clavate tail; lateral sepals united into a broad blade, bifid only at the apex; petals like the dorsal sepal, but smaller; labellum oblong or ovate, often with 2 small teeth near the base. About 12 species, few of which are cultivated for their curious flowers. They are easily grown at a temperature suited for cool Odontoglossums (40–55°). They thrive well planted in a mixture of peat and sphagnum in baskets, which are usually suspended near the glass. They have no definite resting period, but do not require as large a quantity of water in winter as during their most active growth. Pot moderately firm, and rest in a cool house.

antennifera, HBK. Stems slender, clustered, 4–6 in. high, clothed with imbricated scales, and bearing one (rarely more) ovate cordate petioled leaf: peduncle from the axil of the leaf, slender, 1-fld.: dorsal sepal 1½ in. long, lanceolate, tapering into a slender clavate tail, yellow, with purple lines and a purple tip; lateral sepals united into an oblong blade 2-lobed at the tip, yellow, marked with red-purple dots; petals small, antenna-like, purple at the tip. Nov.–Feb. Colombia, Venezuela. B.M. 6288. I.H. 16:601. A.F. 6:631.

Dayàna, Reichb. f. A small plant growing in dense tufts: lvs. roundish, acute, cordate: dorsal sepal and petals filiform, clavate, shining, violet-brown; lower sepals united into a broad, bifid blade, yellow and brown. Costa Rica.

élegans, Karst. Tufted, epiphytic, 2-3 in. high: lvs. 1-1½ in. long, elliptic: peduncles usually in pairs: fls. 1½-2 in. long; dorsal sepal erect, lanceolate, white, streaked purple, with a tail as long as itself, which is clubbed at the tip and yellow; lateral sepals connate into an oblong, emarginate, concave blade, yellow, spotted purple; petals like the dorsal sepal, but spreading and only half the size; lip half the size of the connate lateral sepals and of the same color but edged with red. Venezuela. B.M. 5966. F.S. 7:743.

Heinrich Hasselbring.

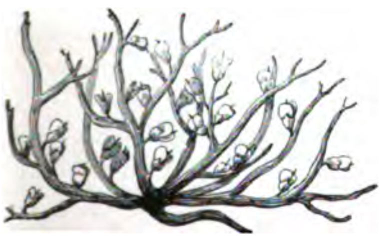


2089. Rose of Jericho in the dry state.

RESURRECTION PLANTS are great curiosities, because they seem to "come to life" after being apparently dead. The commonest ones, shown in Figs. 2089–92, are members of the mustard family and the club moss family. Others are Asteriscus, a composite, and Mesembryanthemum, of the fig-marigold family. These are described below.

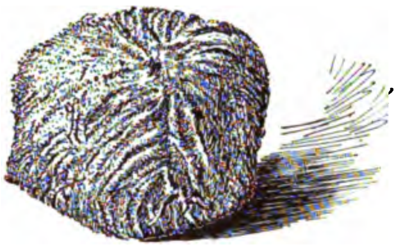
1. The Rose of Jericho is properly *Anastdtica Hierochuntica*, Linn., which name means "Resurrection Plant from Jericho." The plant is a native of the sandy deserts from Arabia and Syria to Algeria. It is an annual and grows about 6 inches high. Soon after flowering the leaves fall off and the branches become woody and roll up into a ball, reminding one of wicker-work or lattice. Inside the ball are the seeds, or, in botanical language, the fruits, which are borne in a protected position near the tips of the inrolled branches. The plants are then uprooted by the winds and are blown about on the deserts. These balls were thought by many to be "the rolling thing before the whirlwind" mentioned in Isaiah, and were brought to Europe by the crusaders. The shape of these balls might be fancifully compared to that of an unopened rose. When the winter rains descend or when the balls are blown into the Mediterranean the branches at once open back and stretch out straight, the fruits open, and the seeds germinate very quickly, "often in the fruit," according to Warming. The dead plants do not, of course, "come to life," but they retain their hygroscopic properties for many years. They may be dried and wetted alternately many times. The vitality of the seed is doubtless considerable, but it is a question whether there is any good scientific record on this point. The balls are often sold by fakirs and dealers in novelties and attempts are often made to grow the plants at home.

Botanically, Anastatica is highly distinct by reason of its short and broad fruit or silicle, which has 2 ear-like appendages at the top. The silicle is divided by a transverse partition into 2 cells, each of which contains a seed. There is only one species. The genus belongs to the Arabis tribe of the Cruciferæ, but is exceptional in not having a long, slender silicle. The growing plant has obovate lvs., the lower ones entire, upper ones toothed, and the fls. are small, white and borne in spikes in midsummer. Excellent pictures of Resurrection Plants may be found in Kerner and Oliver's "Natural History of Plants," together with reliable accounts of the behavior of the various kinds. See also B.M. 4400. G.C. 1872:1068. Gn. 4, p. 111. These plants have much folk-lore.



2090. Rose of Jericho as it opens after being moistened.

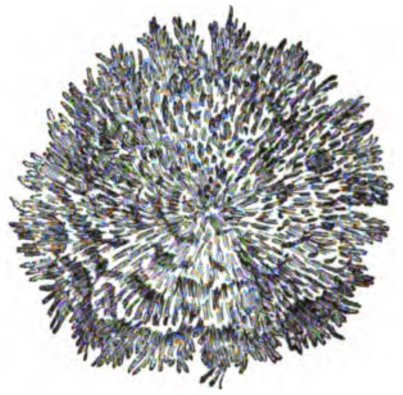
2. The Bird's-nest Moss, *Selaginella lepidophylla*, is a native of Mexico and reaches into western Texas.



2091. Bird's Nest Moss dried into a tight ball.

Many Selaginellas will curl up if allowed to dry, and several of the Mexican species do so in their native places during the dry season, but this species is said to make a tighter mass than any other. When placed in lukewarm water the fronds loosen and roll back into a flat position. The plant may become green and grow, and it is also said that it may be dried and revived an indefinite number of times. Selaginellas are beautiful moss-like plants. What appear to be the leaves are really the branches, and the true leaves are scale-like. See Gn. 17, p. 400. F. 1871, p. 144.

3. *Asteriscus pygmæus*, a member of the composite family, is also called Rose of Jericho, has the same range as No. 1, and was also brought to Europe by the crusaders. The branches do not roll up, but the involucre closes over the head of fruit during the dry season, and is loosened by moisture when the seeds escape. The genus is referred by Bentham and Hooker to Odontospermum. See Fig. 2093.



2092. Bird's Nest Moss, as it opens out flat soon after being moistened.

4. Several species of Mesembryanthemum are known to be hygroscopic. According to Kerner and Oliver, "the capsular fruits of these plants remain closed in dry weather; but the moment they are moistened the valves covering the ventral sutures of the fruit-loculi open back, dehiscence takes place along the ventral sutures, and the seeds, hitherto retained in a double shroud, are washed out of the loculi by the rain." It is doubtful whether these capsules are offered in the trade.

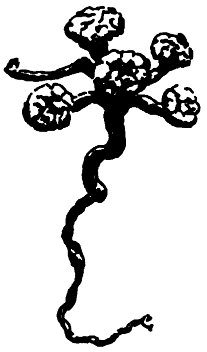
W. M.

Anastatica is occasionally grown for curiosity or for botanical purposes, but the plant is anything but ornamental. The undersigned has often grown it for classes in botany, sowing the seed in February in pots and keeping the plants in pots all summer. Bottom heat is not necessary at any stage, at least in America. The plant could be grown in a window-garden. For his special purpose the writer has been accustomed to sow seeds in Feb. in 4-inch pots, using a light, sandy soil, in a house with a temp. of 60° F. As soon as the seedlings are large enough they are transplanted into other 4-inch pots, 3 plants to a pot. As to the vitality of the seed the writer can only say that the seeds of Cruciferæ, being mealy, not oily, often retain their vitality for five years or more.

Selaginella lepidophylla is a perennial plant. It is rarely cultivated in greenhouses for ornament, like the evergreen kinds. It is chiefly cult. in botanic gardens or by fanciers of ferns and selaginellas, as it is by no means the most beautiful member of the genus. The writer grew a plant of it for four years, and once saw at one of the botanical gardens a plant which through long cultivation had developed a stem almost a foot high. It looked like a miniature tree-fern, except of course that the fronds were arranged in a dense rosette, which gave the fronds a flat rather than a pendulous appearance. Whether the plants received directly from Texas have a crop of spores on them is a question. The spores do not discharge when the plants are wetted. Many extravagant statements are made about the Bird's-nest Moss. The dried plants offered by the trade will turn green and grow unless they are too old or have been kept dry too long. They would probably not grow if kept over more than one season. They cannot be dried again and again indefinitely.

If a plant has been grown in a pot for three or four years and is then dried off it will die. Most people who grow these plants as curiosities place them in a bowl of water with perhaps a little sand and a few pebbles. The water causes them to turn green and they will grow for a time. Then if taken out of the water they may be kept dry for a time and the process repeated, but each time the plant loses its lower or outer circles of fronds much faster than new ones are made and at about the third time the plant is used up.

The writer has a fern which could just as truly be called a Resurrection Plant. The fern is *Polypodium incanum*. It is a native of the southern states, where it grows up the trunks of trees and over rocks and stones. At certain times it is dried up and parched, but as soon as moisture conditions are restored it looks as fresh as ever. The plants are growing on the branch of a tree in a coolhouse and it has been tested several times. It seems that *Selaginella lepidophylla* is a little outside the region in which Selaginellas are most at home and that it has learned to adapt itself to different conditions. In warm, dry countries there are ferns of various genera that dry up and then are resurrected quickly when wet weather comes.



2093. Another "Rose of Jericho"—Asteriscus.

The bracts roll out and make a flat, star-shaped figure.

Edward J. Canning.

RETARDING is the opposite of forcing, and consists in keeping plants in cold storage, thereby preventing them from growing during their natural season. Its object is to supplement natural methods and forcing in order to produce the same thing the year round. At present the lily-of-the-valley is the only plant of the first importance which is retarded in commercial establishments. There is sufficient demand for these flowers all the year round to justify the expense of cold storage. Lily-of-the-valley "pips" may be taken from cold storage and forced into bloom in three weeks. Plants that have been retarded need very little heat when they are allowed to grow; they are eager to start, and a temp. of 45° to 50° is sufficient. *Lilium speciosum, longiflorum* and *auratum* will bloom in 10–12 weeks from cold storage; *Azalea mollis* in 3–4 weeks; spireas in about 5 weeks. Seakale and lilacs have also been retarded with profit. Goldenrod has been kept in an ice-house all summer and flowered for Christmas with happy results. The art of retarding plants is making great progress at present, and with the growth of popular taste for flowers the list of retarded plants may be greatly extended in the future. See A.F. 16:654, 655 (1900).

RETINÍSPORA. Often but not originally spelled *Retinospora*. A genus of conifers founded originally by Siebold and Zuccarini on the two Japanese species of Chamæcyparis, chiefly distinguished from the American species by the resinous canals of the seeds (from Greek *retine*, resin, and *spora*, seed). Afterwards the genus was united with Chamæcyparis, but in horticultural nomenclature the name is applied to a number of juvenile forms of Thuya and Chamæcyparis chiefly introduced from Japan. As these juvenile forms all resemble each other very much, indeed much more than they do the typical forms to which they belong, it is not strange that they should have been considered to be distinct species and even to belong to a separate genus. Even botanists failed to recognize the true relation of these forms and went as far as to place one of them in the genus Juniperus. With the exception of *Retinispora ericoides*, which C. Koch recognized as the juvenile form of *Thuya occidentalis*, the origin of these juvenile forms remained doubtful until L. Beissner, after having carefully studied the subject for years, disclosed the relationship of the various forms. He showed by experiment that it is possible to raise the same form by making cuttings from seedlings which have still retained their primordial foliage, and he also published cases in which larger plants of these doubtful forms had been observed accidentally to develop branches with the foliage of the typical form. See, also, Gt. 1879, pp. 109 and 172; 1881, pp. 210 and 299, and 1882, p. 152.

There are 4 of these juvenile forms generally in cultivation, each of them with an intermediate form showing either a kind of foliage approaching that of the type or two different kinds of foliage on the same plant. There seems to be no doubt that all these forms have been secured by propagating branches of young seedling plants. All seedlings of Chamæcyparis, Thuya and other genera of the Cupressineæ produce in their juvenile state a kind of primordial foliage very different in appearance from that of the adult plants. The first leaves are always linear and spreading, passing gradually into acicular and at last scale-like leaves. In some plants, especially if they have not sufficient nourishment, the primordial foliage is retained longer than usual and these have probably been selected for perpetuating the juvenile state, by means of cuttings. By continuing through many generations the propagation of those branches which show the juvenile state most distinctly, these forms have become well-fixed varieties and even sometimes bear seeds without changing the foliage on the fruiting branches. These seeds, however, produce plants of the typical form and only a few of them retain the primordial foliage somewhat longer than usual.

The juvenile forms very much resemble some species of Juniperus in habit and foliage. They bear linear spreading leaves in pairs, changing in winter to a brown, reddish, violet or steel color, and do not show the regular frond-like branching of the typical forms. The leaves, however, are much softer and not sharply and acutely pointed as in Juniperus; they are mostly marked with whitish or grayish green lines beneath, which is never the case in Juniperus. Only *Thuya orientalis*, var. *decussata* and some intermediate forms, with acicular suberect leaves, show whitish marks on the upper side of the leaves like Juniperus.

Though these Retinispora-forms are described under the genera and species to which they belong, where also references to illustrations are cited, descriptions may be given here to afford a closer comparison of these similar and much confounded forms. The two forms of foliage in the common red cedar are well shown in Fig. 1203, Vol. II. For other pictures of Retinispora forms, see *Chamæcyparis* and *Thuya*.

Chamæcýparis pisifera, var. **squarròsa**, Beissn. & Hochst. (*Retinispora squarròsa*, Sieb. & Zucc.). Fig. 419. A dense, pyramidal or round-headed bush or sometimes small tree, with light bluish green foliage almost silvery white when young, usually coloring violet in winter: tips of branchlets nodding: lvs. crowded, spreading, very soft, bluish green above, silvery white below. The most ornamental and graceful and the best known of these juvenile forms. The intermediate form var. **plumòsa,** Beissn. & Hochst. (*Retinispora plumòsa*), has smaller, subulate and suberect lvs., and is much planted, especially in its golden variegated form. See Fig. 418, Vol. I.

Chamæcyparis sphæroidea, var. **ericoides,** Beissn. & Hochst. (*Retinispora ericoides*, Zucc.). Fig. 2094. Dense shrub, of stiff, pyramidal or almost columnar habit, with upright branches and bright green foliage, changing to violet-red or brownish red in winter: lvs. bright green above, with 2 bluish lines below. This form is very distinct with its stiff, columnar habit, but is less common in cultivation. The intermediate form var. **Andelyénsis,** Carr. (*Retinispora leptóclada*, Hort.), shows also a stiff, pyramidal habit and bears chiefly small, suberect or almost scale-like lvs., and occasionally branchlets with spreading linear leaves. Fig. 2094.

Thùya occidentàlis, var. **ericoides,** Beissn. & Hochst. (*Retinispora ericoides*, Hort. *R. dùbia*, Carr.). Dense broadly pyramidal or round-headed bush, with upright branches and dull green foliage, changing to brownish green in winter: lvs. linear, soft grayish green beneath. The intermediate form, var. **Ellwangeriàna,** Beissn. (*Retinispora Ellwangeriàna*, Hort.), has usually two kinds of lvs., but the linear lvs. are smaller than those of the preceding form.

Thùya orientàlis, var. **decussàta,** Beissn. & Hochst. (*Retinispora juniperoides*, Carr. *R. decussàta*, Hort. *R. squarròsa*, Hort.). Fig. 2094. Dense, round-headed bush, with bluish green foliage changing to violet or steel color in winter: lvs. rather rigid, bluish green, spreading, concave and with a whitish line above. But rarely cult. and not quite hardy north. The intermediate form, var. **Meldénsis,** Laws. (*Retinispora Meldénsis*, Hort.), has mostly acicular suberect lvs. of the same color as in the preceding var. *Andelyensis*.

Of **Chamæcyparis obtùsa** no juvenile form seems to be in cultivation, but it is highly probable that the recently introduced *Juniperus Sanderi* belongs here. In a list of Japanese conifers from Yokohama, the same form is called *Chamæcyparis obtusa*, var. *ericoides*. It is a dwarf and dense, globose bush, with bluish green spreading linear, obtuse leaves. M.D.G. 1900, 1:489. *Chamæcyparis obtusa*, var. *leptoclada*, Hort., is a form of *C. sphæroidea*.

These juvenile forms are valuable for formal gardening, for rockeries, small gardens and wherever slow-growing and dwarf conifers are desired. They are short-lived and usually become unsightly when older. They are all readily prop. by cuttings. See also *Chamæcyparis* and *Thuya*.

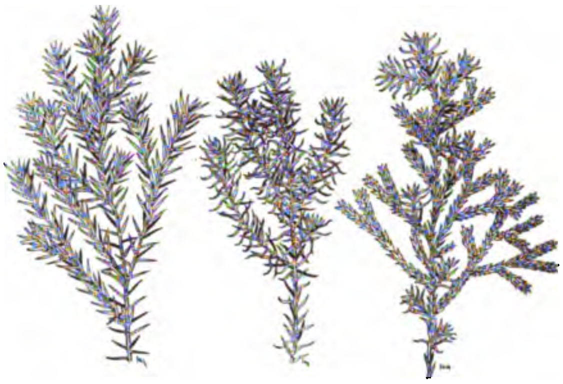
R. decussàta, Hort.=Thuya orientalis, var. decussata.—*R. dùbia*, Carr.=Thuya occidentalis, var. ericoides.—*R. Ellwangeriàna*, Hort.=Thuya occidentalis, var. Ellwangeriana.—*R. ericoides*, Zucc.=Chamæcyparis sphæroidea, var. ericoides.—*R. ericoides*, Hort.=Thuya occidentalis, var. ericoides.—*R. filicoides*, Hort.=Chamæcyparis obtusa, var. breviramea.—*R. filifera*, Stand.=Chamæcyparis pisifera, var. filifera.—*R. juniperoides*, Carr.=Thuya orientalis, var. decussata.—*R. leptóclada*, Zucc.=Chamæcyparis pisifera, var. squarrosa.—*R. leptóclada*, Hort.=Chamæcyparis sphæroides, var. Andelyensis.—*R. lycopodioides*, Gord.=Chamæcyparis obtusa, var. lycopodioides.—*R. Meldénsis*, Hort.=Thuya orientalis, var. Meldensis.—*R. obtùsa*, Sieb. & Zucc.=Chamæcyparis obtusa.—*R. pisifera*, Sieb. & Zucc.=Chamæcyparis pisifera.—*R. rigida*, Carr.=Thuya orientalis, var. decussata.—*R. Sièboldi*, Hort.=Thuya orientalis, var. decussata.—*R. squarròsa*, Sieb. & Zucc.=Chamæcyparis pisifera, var. squarrosa.—*R. squarròsa*, Hort.=Thuya orientalis, var. decussata.

ALFRED REHDER.

REYNÒSIA (Dr. Alvaro Reynoso, 1830–1888, Cuban agricultural chemist and inventor of a machine for increasing the yield of sugar). *Rhamnàceæ*. Three species of tender shrubs or small trees, all native to the West Indies. One of them is also native to Miami and the Florida Keys, and was offered by Reasoner Bros. presumably for its edible fruits. The fls. are minute and devoid of petals, but the berries are half an inch long, oval and purple or nearly black in color. Generic characters: fls. perfect; calyx 5-lobed, the lobes deciduous: ovary 2–3-loculed: ovules solitary, erect: fr. a 1-seeded drupe, with ruminate albumen. This genus is not in Bentham and Hooker's Genera Plantarum, but technical accounts may be found in the Synoptical Flora of North America, Sargent's Silva and Chapman's Flora of the Southern United States.

latifòlia, Griseb. RED IRONWOOD. DARLING PLUM. Slender tree, 20–25 ft. high: lvs. oval, oblong or subrotund, usually emarginate, 1–1½ in. long, leathery; margins revolute: fls. in axillary umbels, borne in May: fr. ripens in November or the following spring. S.S. 2:56.

W. M.



2094. Retinisporas (×⅔).

The specimen on the left is Thuya orientalis, var. decussata; middle, Chamæcyparis sphæroidea, var. ericoides; right, C. sphæroidea, var. Andelyensis.

RHÁMNUS (its ancient Greek name). Including *Frangula*. *Rhamnàceæ*. BUCKTHORN. Ornamental deciduous or evergreen, sometimes spiny shrubs or rarely small trees, with alternate or opposite simple lvs., inconspicuous greenish fls. in axillary clusters appearing in spring shortly after the lvs., and berry-like usually black, rarely red, fruits. The Buckthorns, except *R. cathartica*, are but rarely cult., and the hardiness of several of the species is therefore not yet fully established; but *R. cathartica*, *Dahurica*, *alpina*, *Frangula* and *alnifolia* can be depended upon as hardy, while the northern deciduous forms of *R. Purshiana* and *R. lanceolata* are hardy at least as far north as Mass. *R. Libanotica* and *Caroliniana* are somewhat more tender. The handsomest in foliage are *R. alpina* and *Libanotica*. *R. Purshiana*, *Caroliniana*, *alnifolia Dahurica* and *Frangula* are also noteworthy on account of pretty foliage. Of the evergreen species which are not hardy north, *R. crocea* is to be recommended for its ornamental bright red fruits. Buckthorns are useful for planting in shrubberies; they like a rather moist soil, especially *R. lanceolata*, *alnifolia*, *Caroliniana* and *Frangula*, and grow well in shaded or partly shaded situations, but *R. cathartica* and its allies prefer dry soil. *R. cathartica* is a valuable hedge plant, though it is now not used as extensively as in the past. The species are propagated by seeds stratified or sown in fall, and by layers. Some, as *R. lanceolata*, *alpina* and *alnifolia*, are also prop. by cuttings. The evergreen species are prop. by cuttings of ripened wood under glass. Rarer kinds are sometimes grafted, those of the Frangula groups usually on *R. Frangula* and the true Buckthorns on *R. cathartica* or allied species

Rhamnus is a genus of more than 60 species, native chiefly to the temperate regions of the northern hemisphere. A few species are found in the tropics and as far south as Brazil and S. Africa. Lvs. with small deciduous stipules: fls. small, in axillary clusters, umbels or racemes, perfect, polygamous or diœcious; sepals, petals and stamens 4–5, petals sometimes wanting; style usually undivided: ovary 2–4-loculed: fr. a globular or oblong 2–4-seeded drupe. Several species yield yellow or green dyes and the fruits and bark of some are used medicinally. The wood of *R. Frangula* is made into charcoal valued for the manufacture of gunpowder.

INDEX.

Alaternus, 8,
alnifolia, 5.
alpina, 3, 4.
angustifolia, 8.
anonæfolia, 9.
asplenifolia, 11.
betulifolia, 9.
Californica, 9.
Caroliniana, 10.
castaneæfolia, 4.
cathartica, 1.
Colchica, 4.
crocea, 7.
Dahurica, 2.
Frangula, 9, 11.
grandifolia, 4.
Imeretina, 4.
lanceolata, 6.
Libanotica, 4
occidentalis, 9.
oleifolius, 9.
Purshiana, 9.
rubra, 9.
tomentella, 9.
Wicklia, 1.

A. *Winter-buds scaly: petals usually 4, sometimes 5 or wanting: seeds (not the outer coating of the nutlet) sulcate or concave on the back, with thin cotyledons recurved at the margins: fls. imperfectly diœcious.*
  B. *Lvs. opposite: plants usually spiny shrubs*.................... 1. **cathartica**
    2. **Dahurica**
  BB. *Lvs. alternate: plants unarmed shrubs.*
    C. *Foliage deciduous.*
      D. *Pairs of veins 10–20*......... 3. **alpina**
        4. **Libanotica**
      DD. *Pairs of veins 4–9*........... 5. **alnifolia**
        6. **lanceolata**
    CC. *Foliage evergreen*.............. 7. **crocea**
      8. **Alaternus**
AA. *Winter-buds naked: petals 5: seeds convex at the back, not grooved, with flat and fleshy cotyledons: unarmed shrubs with alternate lvs. —Frangula.*
  B. *Fls. in peduncled umbels*........ 9. **Purshiana**
    10. **Caroliniana**
  BB. *Fls. in 2–6-fld. clusters*..........11. **Frangula**

1. **cathártica,** Linn. (*R. Wicklia*, Hort.). BUCKTHORN. HART'S-THORN. WAYTHORN. RHINEBERRY. Fig. 2095. Shrub or small tree, attaining 12 ft., usually thorny: lvs. oval to elliptic or ovate, usually rounded at the base or cordate, obtuse or acute, crenulate-serrate, glabrous or pubescent beneath, 1¾–3 in. long: fls. in 2–5-fld. clusters, with 4 petals: fr. black, about ¼ in. across. Europe, W. Asia and N. Asia; often escaped from cult. in the eastern U. S. B.B. 2:405. Gng. 9:2.

2095. Rhamnus cathartica (× ½).

2. **Dahùrica,** Pall. (*R. cathártica*, var. *Dahùrica*, Maxim.). Large, spreading shrub, with stout thorny branches: branchlets glabrous: lvs. oblong or sometimes elliptic, narrowed at the base, acuminate, crenulate-serrate, glabrous, somewhat coriaceous at maturity, 2–4 in. long: fls. and fr. similar to those of the preceding species, but fr. somewhat larger. Dahuria to Amurland and N. China, probably also Japan. G.F. 9:425 (as *R. crenata*).—Sometimes cult. under the name of *R. crenata*. See, also, supplementary list. It sometimes becomes a tree 30 ft. tall.

3. **alpìna,** Linn. Shrub, attaining 6 ft., with stout, upright, glabrous branches: lvs. oval to elliptic-ovate, cordate or rounded at the base, abruptly acuminate, crenulate-serrate, dark green above, pale green and glabrous or nearly so beneath, 2–5½ in. long: fls. in few-fld. clusters; petals 4: fr. globose, black, ¼ in. across or less. Mountains of S. and M. Eu. L.B.C. 11:1077.—This and the following species are the handsomest of the deciduous-leaved Buckthorns.

4. **Libanótica,** Boiss. (*R. Imerétina*, Koehne. *R. castanæfòlia*, Hort. *R. grandifòlia*, Hort. *R. alpìna*, var. *Cólchica*, Kusn. *R. alpìna*, var. *grandifòlia*, Regel). Closely allied to the preceding, but larger in every part: shrub, attaining 10 ft.: branchlets and petioles pubescent: lvs. larger and longer, to 9 in. long, pubescent beneath and often bronze-colored at maturity. Caucasus, W. Asia. B.M. 6721.

5. **alnifòlia,** L'Hérit. Low, wide-spreading shrub, attaining 4 ft., with puberulous branchlets: lvs. ovate to oval, obtuse or acuminate, usually narrowed at the base, crenately serrate, glabrous, 1½–4 in. long: fls. in few-fld. clusters, 5-merous, without petals: fr. globose, black, with 3 nutlets. New Brunswick and N. J. to British Columbia and Calif. B.B. 2:406.

6. **lanceolàta,** Pursh. Tall, upright shrub, with puberulous branchlets: lvs. ovate-lanceolate to oblong-lanceolate, acuminate or obtusish, finely serrulate, glabrous or somewhat pubescent beneath, 1–3½ in. long: fls. in few-fld. clusters, with 4 petals: fr. with 2 nutlets. Pa. to Ala., Tex. and Neb. B.B. 2:405.

7. **cròcea,** Nutt. Shrub or small tree, attaining 20 ft., with pubescent young branchlets: lvs. orbicular to oblong-obovate, dentate-serrate, dark green and lustrous above, bronze- or copper-colored and glabrous or slightly pubescent beneath, ⅓–1½ in. long: fls. in few-fld. clusters, 4-merous, apetalous: fr. bright red, about ¼ in. across, edible. Calif. S.S. 2:59, 60.

8. **Alatérnus,** Linn. Shrub or small tree, attaining 20 ft., with glabrous branches: lvs. oval or ovate to ovate-lanceolate, acute, serrate or almost entire, glossy and dark green above, pale or yellowish green beneath, glabrous, ¾–2 in. long: fls. in short racemes, with 5 petals: fr. bluish black. S. Eu.—Var. **angustifòlia,** DC. (*R. angustifòlia*, Hort.), has narrower, oblong lanceolate lvs. There are also varieties with variegated foliage.

9. **Purshiàna,** DC. Tall shrub to medium-sized tree, occasionally attaining 40 ft.: young branchlets pubescent or tomentose: lvs. elliptic to ovate-oblong, acute or obtuse, usually denticulate, with often wavy margin, dark green above, glabrous or pubescent beneath, 1–7 in. long: peduncles longer than petioles: fr. globose, changing from red to black, about ⅓ in. across, with 2–3 nutlets. Brit. Col. to Mex., west to Mont. and Texas. S.S. 2:62, 63.—A very variable species. Var. **Califórnica,** Rehd. (*R. Califórnica*, Eschsch. *R. oleifòlius*, Hook.). Usually shrubby, evergreen or half-evergreen: lvs. smaller and narrower, 1–4 in. long, often almost entire. Calif. to Ariz. and New Mex. R.H. 1874, p. 354. Var. **tomentélla,** Sarg. (*Frángula Californica*, var. *tomentélla*, Gray). Allied to the preceding var., but lvs. densely white-tomentose beneath. R.H. 1858, p. 658; 1872, p. 194 (as *R. incana*). *R. anonæfòlia*, *betulifòlia* and *rùbra*, Greene, and *R. occidentàlis*, Howell (see G.F. 10:285) also belong here.

10. **Caroliniàna,** Walt. INDIAN CHERRY. Shrub or small tree, attaining 30 ft.: young branches puberulous: lvs. elliptic to oblong, acute or acuminate, obscurely serrulate or almost entire, lustrous and dark green above, glabrous or nearly so, somewhat leathery at length, 2–6 in. long: peduncles shorter than petioles: fr. globose, about ⅓ in. across, red changing to black, sweet, with 3 nutlets. N. Y. to Fla., west to Neb. and Tex. S.S. 2:61. B.B. 2:406.

11. **Frángula,** Linn. (*Frángula Álnus*, Mill.). Shrub or small tree, attaining 12 ft.: lvs. broadly obovate to obovate-oblong, acute, entire, dark green above, glabrous, 1–2½ in. long: fr. red, changing to black, with 2 nutlets. Eu., N. Afr., W. Asia and Siber.; escaped from cultivation in some localities in the eastern states. Gng. 8:3. B.B. 2:406.—Var. **aspleniifòlia,** Dipp. Lvs. linear, un-

dulate; an interesting form of very distinct appearance with its feathery foliage. *R. Frangula* is a handsome lawn shrub with shining foliage and attractive berries.

R. argùta, Maxim. Unarmed glabrous shrub, allied to R. cathartica: lvs. orbicular-ovate, acuminate, sharply serrate, with bristly pointed teeth. Amurland. Probably hardy.—*R. Billárdi*, Hort. = R. hybrida, var.—*R. chloróphora*, Dcne. Closely allied to R. tinctoria and probably only a var.: lvs. larger, becoming 3 in. long: pedicels slenderer. China. Gn. 14, p. 29. Not quite hardy.—*R. crenàta*, Sieb. & Zucc. Unarmed shrub, 4–10 ft., allied to R. Caroliniana: lvs. ovate to ovate-oblong, acute, rusty pubescent beneath when young. Japan. Has been confounded with R. Dahurica, which is easily distinguished even without lvs. by its scaly winter-buds. Seems not quite hardy.—*R. Erythróxylon*, Pall. Unarmed shrub, allied to R. cathartica: lvs. alternate, oblong-lanceolate to linear. Caucasus to Mongolia and Siberia. Hardy.—*R. hýbrida*, L'Hérit. (R. Alaternus×alpinus). Half-evergreen shrub, with alternate, oval-oblong, glossy lvs. Var. Billardi, Lav. Lvs. narrower, more remotely serrate. Half-hardy shrub, with handsome glossy foliage.—*R. Japónica*, Maxim. Spiny shrub, attaining 10 ft., allied to R. Dahurica: lvs. obovate or elliptic-obovate: fls. with the style almost divided to the base. Japan. Hardy. Very similar in habit to R. Dahurica, which may be distinguished in winter by its dull gray branchlets and its ovate, obtuse, slightly spreading winter-buds, while R. Dahurica has glossy light yellowish brown branchlets and slender acute winter-buds closely appressed to the branch.—*R. latifòlia*, L'Hérit. Allied to R. Frangula: lvs. larger, elliptic-oblong, with 12–15 pairs of veins, becoming 5 in. long. Azores. B.M. 2663. Not hardy.—*R. pùmila*, Linn. Low, sometimes procumbent shrub, allied to R. alpinus, with smaller and shorter lvs., usually narrowed at the base. Europe, Alps. Hardy.—*R. rupéstris*, Scop. Low, often procumbent shrub, about 3 ft. high, allied to R. Caroliniana: lvs. ovate to oblong-obovate, thin, 1–3 in. long: umbels 1–3-fid. Alps of eastern Eu.—*R. saxátilis*, Linn. Low and dense, very spiny shrub, about 3 ft. high, allied to R. cathartica: lvs. opposite or alternate, oval or obovate, glabrous, about 1 in. long. Mts. of M. and S. Eu., W. Asia. Hardy.—*R. tinctòria*, Waldst. & Kit. Closely allied to the preceding, but lvs. pubescent. Mts. of M. and S. Eu., W. Asia.

ALFRED REHDER.

RHAPHIDÓPHORA (Greek for *needle-bearing;* alluding to needle-like hairs). *Aràceæ*. About 20 species of the East Indies, allied to Pothos, but distinguished from the Pothos tribe by the presence of odd hairs in the intercellular spaces and by the 2-loculed rather than 3-loculed ovary. See *Pothos*. It is probable that the garden plant *Pothos aureus* is of this genus. Rhaphidophoras are climbing aroids, to be treated like Philodendron and Pothos.

It is not known that any species of Rhaphidophora are in the American trade. *R. pertùsa*, Schott (*R. pinnàta*, Schott. *Scindápsus pertùsus*, Schott), has large monstera-like lvs., with long and narrow side lobes and numerous holes in the blade. R.H. 1883, p. 561. *R. decursìva*, Schott, is a gigantic climber, with large pinnate lvs., the segments or lfts. oblong-lanceolate-acuminate and strongly nerved; spathe yellowish. B.M. 7282. *R. Peèpla*, Schott, has entire oblong or elliptic-oblong lvs., with roundish or subcordate base; spathe yellowish.

RHAPIDOPHÝLLUM (Greek, probably means *Rhapis-leaved*). *Palmàceæ*. BLUE PALMETTO. A genus of one species ranging from South Carolina to Florida. It is a dwarf fan-palm with erect or creeping trunk 2–3 ft. long, and long-stalked lvs. with about 15 segments. The genus is closely allied to Chamærops and is distinguished by having the albumen not ruminate and by the bracts at the base of the branches of the spadix being few or none.

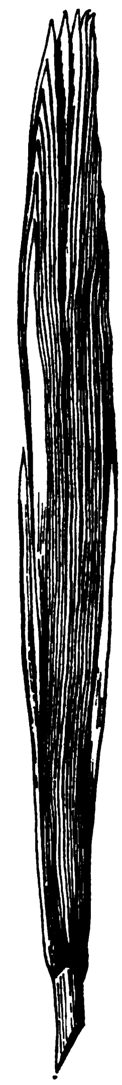
Other generic characters: spadices short-peduncled: spathes 2–5, entire, tubular, compressed, bifid, woolly: fls minute, orange: fr. small, ovoid or obovate, woolly. The plant is said to produce suckers freely, like Rhapis, an unusual circumstance among palms.

Hýstrix, H. Wendl. & Drude (*Chamærops Hýstrix*, Fras.). Fig. 2096. Stem 2–3 ft., erect or creeping, proliferous, clothed with the fibrous remains of leaf-sheaths intermingled with long, erect spines: lvs. 3–4 ft., somewhat glaucous, circular in outline, with numerous 2–4-toothed segments; petiole triangular, rough on the margins: sheaths of oblique fibers interwoven with numerous strong, erect spines; spadix 6–12 in. long, short-peduncled: drupe ¾–1 in. long. S.C. to Fla. I.H. 30:486.

JARED G. SMITH.

Rhapidophyllum Hystrix, the Blue Palmetto or Needle Palmetto, is the most beautiful and elegant of our native dwarf palms. It is very local in its distribution, being found in rich, low soil both in Georgia and Florida, but it is everywhere rather rare. Its most striking characteristics are the long, sharp, black spines projecting in every direction from the dark fibers which cover the trunk. These spines, which are often a foot long, seem to protect the inflorescence, which before opening resembles a large white egg and which is imbedded among the spines. This palm bears staminate and pistillate flowers on separate plants. The woolly clusters of fruit or seeds are borne on short stems also surrounded by the sharp spines. This palmetto is easily transplanted. The lvs. are dark shiny green, relieved by a pale silvery gray on the under surface. It is a very beautiful plant, and groups of it are striking. The stem is 2 to 3 feet high and the leaves rise to a height of 3 to 4 feet.

H. NEHRLING.



2096. Young leaf of Blue Palmetto, not yet unfolded (×¼).

RHAPIÓLEPIS. See *Raphiolepis*.

RHÀPIS (Greek, *needle;* alluding to the shape of the lvs. or perhaps the awns of the corolla). *Palmàceæ*. A genus of 5 species of fan-palms of very distinct habit, natives of China and Japan. They are among the few palms that produce suckers at the base, thereby forming bushy clumps. Low palms, with leafy, densely cespitose reedy stems clothed with remains of the reticulate leaf-sheaths: lvs. alternate and terminal, sub-membranaceous, connate or semi-orbicular, irregularly and digitately 3- to many-parted; segments linear, cuneate, or elliptical truncate, entire, dentate or lobed: nerves 3 to many; transverse veins conspicuous; rachis none; ligule very short, semi-circular; petiole slender, biconvex, smooth or serrulate on the margins; sheath long, loosely fringed on the margin; spadices shorter than the lvs., slender-peduncled: rachis sheathed by deciduous bracts: branches spreading: spathes 2–3, incomplete, membranous: fls. yellow. This genus is distinguished from its near allies (for a list of which see Licuala) by the fls. being diœcious; corolla 3-toothed; anthers dehiscing extrorsely. The name Rhapis is commonly spelled and pronounced Raphis, but this is incorrect.

A. *Stems 1½–4 ft. high.*

B. *Lvs. with 5–7 segments.*

flabellifórmis, L'Herit. (*R. Kwaniwórtsik*, H. Wendl.). Fig. 1623, Vol. III. Stems 1½–4 ft. high: lvs. 5–7-parted; segments linear, subplicate, ciliate-spinulose along the margins and midveins, truncate, erose at the apex: petioles serrulate along the margins. China, Japan. B.M. 1371. R.H. 1872, p. 230. A.G. 13:261. I.H. 34:13. —Var. **intermèdia**, Hort., according to Siebrecht, has lvs. horizontal instead of somewhat erect. Var. **variegàta**, Hort., has been offered.

BB. *Lvs. with 7–10 or more segments.*

hùmilis, Blume. Fig. 2097. Lvs. semi-circular; basal lobes directed backward; segments rarely more than 10, spreading; petioles unarmed. China. A.F. 7:405.

AA. *Stems becoming 8 ft. high.*

Cochinchinénsis, Mart. (*Chamærops Cochinchinénsis*, Lour.). Leaf-segments much plaited; petioles short, straight and prickly. Cochin China. Int. by Franceschi, 1900.

JARED G. SMITH and W. M.

RHÈUM (*Rha* was the old Greek name for rhubarb). *Polygonàceæ.* RHUBARB. Twenty species of robust perennial herbs, according to Meisner (DC. Prodr. 14, pp. 32–37), natives of Asia and Russia. Lvs. mostly radical, very large, entire or divided, on stout, thick petioles: fls. perfect, small, greenish or whitish, pedicellate, in numerous panicled fascicles or racemes, the inflorescence elevated above the lvs. on stout, mostly hollow scape-like stems, which are provided with sheathing stipules or ocreæ (Fig. 2098); the perianth 6-parted and spreading; stamens 9 or 6: ovary 3-angled and bearing 3 styles, ripening into a winged or sometimes nearly succulent akene.

2097. Rhapis humilis. (See page 1511.)

Aside from the common Rhubarb, *Rheum Rhaponticum*, which is grown for the edible leaf-stalks, the species are little known in general cultivation. Few plants are more useful, however, for bold and striking foliage effects; and these effects are heightened by the towering flower-panicles. Most of the species are hardy and easy to grow, but they profit by a liberal winter mulch. Rheums are usually seen to best advantage against a heavy background of foliage or of rock (Fig. 1045, p. 733). Even the common Rhubarb is a useful ornamental subject when well placed. In order to secure large and fine foliage, the soil should be rich and moist. The species are propagated by dividing the roots, preferably in spring, leaving as much root as possible with each strong bud.

The dried rhizomes of Rhubarb are used medicinally. Several species afford the officinal product. It is now believed, however, that the larger part of the dried Rhubarb imported from the Orient is made from the crown or short stem (not the flower-stem) of *R. officinale*. *R. Rhaponticum* is sometimes grown for its roots.

A. *Foliage undivided, the margins of the lvs. nearly or quite entire.*

B. *Lvs. (at least on the flower stalks) acute or acuminate.*

Rhapónticum, Linn. (i. e., *Pontic Rha*, "Rhubarb of Pontus," a province of Asia Minor). RHUBARB. PIE-PLANT (in the U. S.). WINE-PLANT. Fig 2098. Strong perennial, with thick clustered roots: petioles semi-cylindric, plane above: lf.-blades suborbicular, deeply cordate at base, undulate, about 5-ribbed, glabrous and shining above, pubescent on the veins beneath: panicles tall and narrow, somewhat leafy, densely flowered, the pedicels jointed below the middle, the fls. whitish: akene oblong-oval. In deserts and subalpine parts of southern Siberia.—Nearly everywhere grown in this country for the succulent acid petioles, which are used in early spring for pies and sauces. Wine is sometimes made from the juice. In France, known usually as an ornamental plant. There are several garden varieties. See *Rhubarb.*

undulàtum, Linn. Petioles semi-terete, lightly channeled above, the leaf-blades ovate-cordate and strongly undulate (basal sinus not so deep as in the last), 5–7-ribbed, glabrous above and puberulent beneath, the upper ones long: panicle narrow and leafy below, the pedicels jointed near the base: akene ovate or oval. Siberia.—Small plant, earlier than *R. Rhaponticum.*

BB. *Lvs. obtuse.*

Emòdi, Wall. Stem tall and leafy: petioles semi-terete, somewhat concave above, the margins obtuse: leaf-blades large, ovate, cordate, obtuse, somewhat undulate, 5–7-ribbed, the under surface and the margin pubescent: panicles fastigiately branched, the fls. dark purple, pedicels jointed below the middle: akene large, ovate or oblong-oval. Himalaya, in alpine and subalpine regions. B.M. 3508 (this figure is questioned by Meisner, who thinks it may represent *R. australe*).—Foliage has a coppery hue.

AA. *Foliage more or less lobed, the margins of the lvs. or segments usually toothed or notched.*

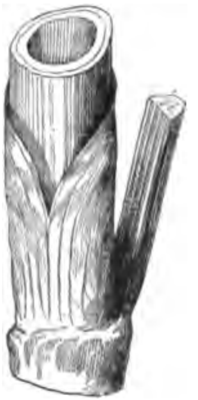
B. *Lvs. shallowly or obscurely lobed.*

compáctum, Linn. Stem tall: petioles sulcate, plane above: leaf-blades thickish, broad-ovate, cordate, undulate and obscurely lobed, very obtuse, glabrous and shining above, the margin strongly toothed, the veins very prominent: panicle with drooping branches: akene large, dark-colored. Siberia to China.

BB. *Lvs. deeply lobed or evenly divided.*

palmàtum, Linn. (*R. sanguineum*, Hort.). Stem tall and leafy: petioles subcylindrical, the margin rounded: leaf-blades broad, suborbicular and cordate, 3–5-ribbed, scabrous, deeply palmately lobed; the lobes ovate-oblong or lanceolate, acute, entire, dentate or pinnatifid: panicle leafy, with pubescent branches, the pedicels scarcely longer than the fls.: akene oblong-oval and subcordate. Northeastern Asia.

Var. **Tanghùticum**, Hort. (*R. Tanghùticum*, Hort.). Lvs. more elongated and not so deeply lobed.



2098. Ocrea or stipular sheath of Rhubarb. (× ⅓.)

hỳbridum, Murr. Petiole long, canaliculate above and sulcate beneath: leaf-blades ovate, 3–5-ribbed, the base cuneate or scarcely cordate, incise-dentate, puberulent beneath: panicle lax, leafy: akene large, ovate.—Seems to be unknown wild. Perhaps a hybrid series between *R. palmatum* and *R. Rhaponticum*. Perhaps *R. officinale* is concerned in it. This name does not occur in the American trade, but it is not unlikely that the plant is in cult. in this country.

Colliniànum, Baill. Probably one of the *R. hybridum* series, with much-cut broad lobes that extend half the depth of the leaf-blade: fls. red. China.

officinàle, Baill. Figs. 1045, 2099. Robust, with a short branching stem or crown 4–10 in. high: lvs. very large, 1–3 ft. across, round-oval, more or less pointed or acuminate, hairy, 3–7-lobed, the lobes extending one-third or one-half the depth of the blade and sharply angled-notched: flower-stems 3–5 ft., much branched,

bearing numerous greenish fls. that give a feathery effect to the panicle: akene red, winged. Thibet and W. China, on high table-lands. B.M. 6135. R.H. 1874, p. 95. Gn 35, p. 243; 48, pp. 199, 208.—Probably the best plant of the genus for general cultivation, making a most striking foliage plant. It is from the short, thick, branching stem or caudex of this plant that most of the true official Rhubarb is derived. Although known to the Chinese for centuries and the product long imported into Europe, the plant was not described botanically until 1872. Fig. 2099 is adapted from The Garden.

R. acuminàtum, Hook. f. & Thom. "Probably only a small form of R. Emodi, with acuminate lvs., but the fls. are considerably larger, and though long under cultivation it does not attain half the size of that plant, or vary in its character."—Hooker. Himalayas. B.M. 4877.—*R. nóbile*, Hook. f. & Thom. Stem simple and densely clothed with imbricated downward-pointing bracts that conceal the short axillary peduncles: lvs. ovate-oblong or rounded, entire. When the fruit is ripe, the shingled bracts are torn away by the winds, leaving the long panicle exposed. 3 ft. Himalayas. R.H. 1876, p. 266. I.H. 22:209. G.C. II. 13:793. A remarkable alpine plant.—*R. Ribes*, Linn. 3–5 ft.: lvs. 1 ft. across, cordate to reniform, the margins crisped or undulate, the blade puckered or blistered: fls. green, drooping: frs. about 1 in. long, oblong-cordate, narrow-winged, blood-red, showy. Asia Minor to Persia. B.M. 7591. "Rivas" or "Ribes" is its Arabic name.—*R. spicifórme*, Royle. Dwarf: lvs. thick, orbicular or broadly ovate: fls. white, in a dense spike rising about 2 ft. Western Himalaya.

L. H. B.

RHEUMATISM ROOT. *Jeffersonia binata.*

RHÉXIA (Greek, *rupture;* referring to its supposed properties of healing). *Melastomàceæ.* MEADOW BEAUTY. A genus of about 10 species of N. American perennial herbs, with opposite sessile or short-petioled, 3–5-nerved lvs. and showy flowers borne in late summer. Fls. terminal, solitary or in cymes; calyx-tube urn- to bell-shaped, narrowed at the neck, 4-lobed; petals 4, obovate; stamens 8, equal, the connective being thickened at the base, with or without a spur at the back.

Rhexia Virginica is found wild in company with side-saddle plants (*Sarracenia purpurea*) and cranberries in the low meadows of Massachusetts. It is what we should call a bog plant. It is a pretty, low-growing, tuberous-rooted plant blooming in summer and chiefly interesting as being one of few species of a genus belonging to a family almost wholly composed of shrubby plants from tropical countries, such as Centradenia, Pleroma and Medinella. It increases by means of tubers and seeds, and under suitable conditions soon makes large clumps. Tubers potted in the autumn and kept in a coldframe force nicely in spring-time.

2099. Rheum officinale.

A. *Stem cylindrical.*

Mariàna, Linn. A slender, erect, usually simple-stemmed plant with reddish purple fls. about 1 in. across, in loose cymes: lvs. short-petioled, oblong to linear oblong, 1–1¼ in. long, 2–5 lines wide, 3-nerved; anthers minutely spurred at the back. June–Sept. Pine barrens, N. J. to Fla., west to Ky. B.B. 2:474.—Grows in drier places than *R. Virginica.*

AA. *Stem angled.*

B. *Petals yellow.*

lùtea, Walt. Stem becoming much branched, 1 ft. high: lvs. smooth, serrulate, the lower obovate and obtuse, the upper lanceolate and acute: fls. small, in numerous cymes. July, Aug. Pine-barren swamps, N. C. to Fla. and west.

BB. *Petals not yellow.*

C. *Lvs. 6–10 lines long.*

ciliòsa, Michx. Stem nearly simple, 1–2 ft. high: lvs. ovate, sessile or very short-petioled, 3-nerved: fls. violet-purple, 1–1½ in. across, short-pedicelled, in few-fld. cymes; anthers not curved and not spurred at the back. June–Aug. Swamps, Ind. to Fla., west to La.

CC. *Lvs. 1–2 in. long.*

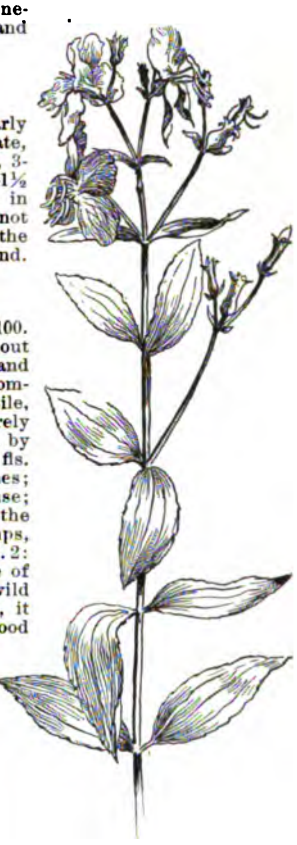
Virgínica, Linn. Fig. 2100. Roots tuber-bearing: stems about 1 ft. high, branched above and usually clustered, forming a compact, bushy plant: lvs. sessile, ovate, acute, rounded or rarely narrowed at the base, 1–2 in. by ½–1 in., usually 5-nerved: fls. rosy, 1–1½ in. across, in cymes; petals rounded or slightly retuse; anthers minutely spurred on the back. July–Sept. Sunny swamps, Me. to Fla., west to Mo. B.B. 2: 474. B.M. 968.—This is one of the prettiest of the small wild flowers. When transplanted, it seems to thrive as well in good clay loam as in peaty soils, although it sometimes grows in the latter.

F. W. BARCLAY and
T. D. HATFIELD.

RHINE-BERRY. *Rhamnus cathartica.*

RHIPIDODÉNDRON. See *Aloe.*

RHIPIDÓPTERIS is under *Acrostichum.*



2100. Rhexia Virginica. (×½).

RHÍPSALIS (Greek, *rhips*, wickerwork). *Cactàceæ.* A mixed assemblage of lengthened epiphytic forms, brought together by a common character of small fls., with the tube short or wanting; here including Hariota, Lepismium and Pfeiffera. Fls. white or greenish white, except *R. cereiformis*, rosy, and *R. salicornioides*, *R. pachyptera* and *R. rhombea*, yellow. Fruit without spines or wool, except in *R. cereiformis.* For culture, see *Cactus.*

INDEX.

alata, 14.
brachiata, 2.
Cassytha, 5.
cereiformis, 7.
commune, 11.
funalis, 4.
grandiflora, 4.
Houlletiana, 15.
Houlletii, 15.
ianthothele, 7.
mesembrianthemoides, 3.
myosurus, 12.
pachyptera, 14.
paradoxa, 9.
pentaptera, 10.
rhombea, 13.
Saglionis, 2.
salicornioides, 1.
squamulosa, 11.
Swartziana, 13.
trigona, 8.
virgata, 6.

A. *Branches round or nearly so in cross-section: fls. white except in the first species: berry small, white, round.*

B. *The branches of two kinds*............... 1. **salicornoides**

2. **Saglionis**

3. **mesembrianthemoides**

BB. *The branches all alike* .... 4. **grandiflora**
5. **Cassytha**
6. **virgata**

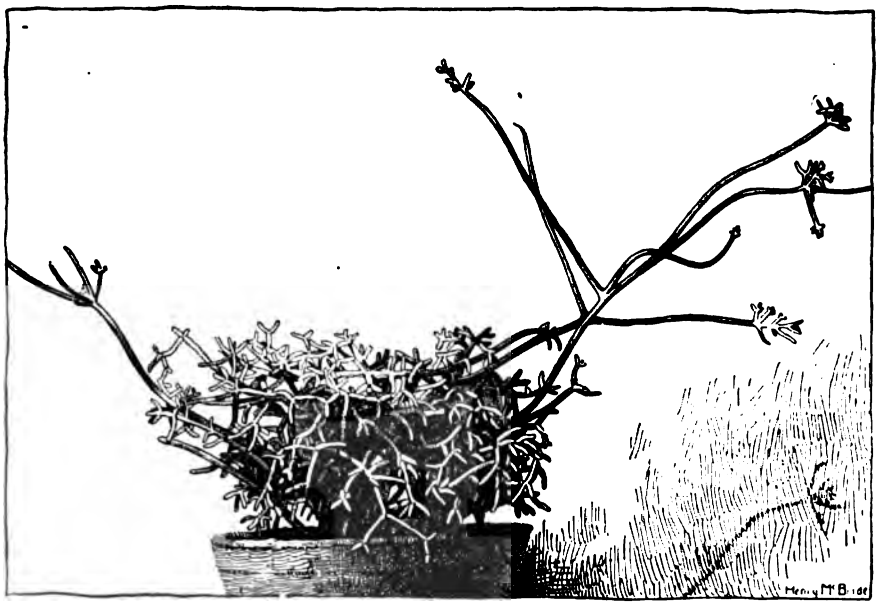
AA. *Branches angular: fls. and fr. not immersed.* 7. **ianthothele**
8. **trigona**
9. **paradoxa**
10. **pentaptera**

AAA. *Branches angular, often nearly covered with roots: areolæ hollowed, the fl. and fr. immersed, with copious bristles* ....11. **squamulosa**
12. **myosurus**

AAAA. *Branches flat, rarely triangular, crenate or serrate, with middle- and usually side-ribs; rarely setulose: fls. yellow or yellowish*...13. **rhombea**
14. **pachyptera**
15. **Houlletiana**

1. **salicornioides,** Haw. (*Hariòta salicornioìdes,* DC.). Plant upright, reaching a height of 18 in., richly branched; areolæ hardly setulose or lanate: stems cereiform, with cylindric or oblong-elliptic joints: mature or fruiting branches with verticillate, club- or flask-shaped joints, with slender base, all apparently, as well as the fls. and fr. growing from the tops of joints: fls. yellow, funnelform, ⅛ in. long: berry small, whitish. Brazil. B.M. 2461.

2. **Sagliònis,** Otto (*R. brachiàta,* Hook. *Hariòta Sagliònis,* Lem.). Fig. 2101. Reaching a height of 2 ft., richly branched: long or cereiform branches ⅛–1 ft. long; secondary or fruiting branches oblong-elliptic or short-cylindric, rounded at the ends, spirally or rarely verticillately arranged, sometimes weakly grooved, not more than ⅙ in. long: areolæ with very scanty wool and 2–4 short bristles, which on the end branches project as a little brush: fls. near the tops of the short branches, flat, ⅜ in. in diam., with 12 white leaves with yellowish midstripe: berry white. Uruguay and Argentina. B.M. 4039 (*R. brachiata*).



2101. Rhipsalis Saglionis (×¼).

3. **mesembrianthemoides,** Haw. (*Hariòta mesembrianthemoìdes,* Lem.). Upright, the ends drooping, richly branched: long branches 4–8 in. long, 1 line in diam.; fruiting branches 3–5 lines long, not more than 2 lines in diam., spirally attached, thickly crowded: areolæ sparsely woolly, with 1–2 bristles which project from the ends of the branches: fls. near the top of the joint, about 5 lines in diam., formed of 10 white with yellow midstriped leaves: berry white. Brazil. B.M. 3078.—Hardly more than a slender variety of the preceding.

4. **grandiflòra,** Haw. (*R. funàlis,* Salm.). Branching, cylindrical, rather stout, the branches reaching a height of 3 ft., with a diameter of more than ⅛ in.; ultimate branchlets short, often verticillate: areolæ depressed, bordered by a red line, sometimes in old branches bearing a bristle: fls. wheel-shaped, lateral on the branches, nearly 1 in. in diam. Brazil. B.M. 2740.

5. **Cassỳtha,** Gaertn. Richly branching, pendulous, sometimes 10 ft. long; branches rarely 2 ft. long, 1–1⅓ lines in diam., pale green; ultimate branchlets spirally attached: areolæ with sparse woolly hairs and frequently 1–2 minute bristles: fls. lateral on the terminal joints, 2–3 lines in diam.: berry like that of the mistletoe, 1–2 lines in diam. Widely dispersed in Central and S. America, West Indies, Mex., Mauritius, Ceylon and Africa. B.M. 3080.

6. **virgàta,** Web. Richly branching, pendulous, becoming a yard long; terminal branchlets hardly more than a line thick, spirally attached: areolæ bearing sparse woolly hairs, with an occasional bristle: fls. lateral, 3–4 lines in diam.: berry only 1⅓ lines in diam. Brazil.—Very much like the preceding.

7. **ianthothèle,** Web. (*Pfeìffera ianthothèlus,* Web. *R. cereifórmis,* Forst. *Pfeìffera cereifórmis,* Salm.). Stems pendent, 1–2 ft. long, branching, less than 1 in. in diam., 4-, rarely 3-angled; ribs tuberculate; areolæ at summit of tubercles short-woolly, soon naked, bearing 6–7 short bristles: fls. with very short tube, but the fl. bell-shaped, purple-red without, pure white within, nearly 1 in. long, little more than half as much wide: fr. the size of a cherry, rose-red, with bristles like those of the stem. Argentina.

8. **trigona,** Pfeiff. Richly branched, becoming a yard long: branches ½ to nearly 1 in. in diam., 3-angled: areolæ sparsely woolly and bristly, the blooming areolæ much more copiously so: fls. greenish outside, white within, 4 or 5 lines long. Brazil.

9. **paradóxa,** Salm. Sparingly branched, 1–2 ft. long; branchlets 1–2 in. long and ½–1 in. in diam., twisted at the joints, so that the angles alternate with the sides: fls. ⅔ in. long, white. Brazil.

10. **pentáptera,** Pfeiff. Richly branched, 1–2 ft. long, 4–5 lines in diam.: branchlets 2–5 in. long, 5–6-angled or almost winged: areolæ in crenatures of the angles with scanty wool and an occasional bristle: fls. greenish white, 3–4 lines long: fr. white, bright rose-red above crowned by the withered flower. South Brazil, Uruguay, Argentina.

11. **squamulòsa,** Schum. (*Lepismium commùne,* Pfeiff.). Somewhat branched, reaching a length of 2 ft.: branches very unequal in length, ⅛–1 in. thick, triangular, the angles winged: fls. 1–2, from the deep areolæ, 5 lines long, greenish without, yellowish within. Brazil, Argentina. B.M. 3763.

12. **myosùrus,** Schum. (*Lepismium myosùrus,* Pfeiff.). Somewhat branched, a yard long: branches 3–6 lines thick, 3–4-angled, the angles not winged, the terminal branchlets generally acuminate, often tipped by a pencil of bristles: fls. solitary in the deep areolæ, 4–5 lines long, rosy white: fr. red. Brazil. B.M. 3755.

13. **rhómbea,** Pfeiff. (*R. Swartziàna* (?), Pfeiff.). Branching, reaching a yard in length; joints green, leaflike, crenate-oblong or rhombic, 1–5 in. long, ⅛–2 in. broad: fls. yellow, about 5 lines long. Brazil.

14. **pachýptera,** Pfeiff. (*R. alàta,* Steud.). Erect, branching, reaching a height of nearly 1 yard; joints flat, rarely 3-winged, rather thick, usually somewhat concavo-convex, 3–8 in. long, blunt, 2–5 in. broad, often purple-red: fls. about 8 lines long, yellow with reddish tips. Brazil. B.M. 2820 (*Cactus alatus*).

15. **Houlletiàna,** Lem. (*R. Houllétii,* Lem.). Stem richly branched, becoming 3 ft. or more long, 1–1⅛ in. broad, often tapering to the round midrib for a considerable distance, then becoming again broad and leaflike: fls. 8–9 lines long, yellowish white to yellow: berry red. Brazil. B.M. 6089.

KATHARINE BRANDEGEE.

RHIZÓPHORA is discussed under *Mangrove.* The plant is now offered for sale in S. Calif.

RHODÁNTHE. See *Helipterum.*

RHÒDEA. See *Rohdea.*

RHODE ISLAND, HORTICULTURE IN. Figs. 2102, 2103. Rhode Island, the most thickly populated state in the Union, is distinctly a manufacturing center. This condition of things, which brings the larger portion of the population together into the cities and villages, together with the steadily increasing popularity of its famous summer resorts and the rapid transportation both by rail and water which place the New York and Boston markets within easy reach, affords opportunities for horticultural developments which are equaled by few and excelled by none of the eastern states.

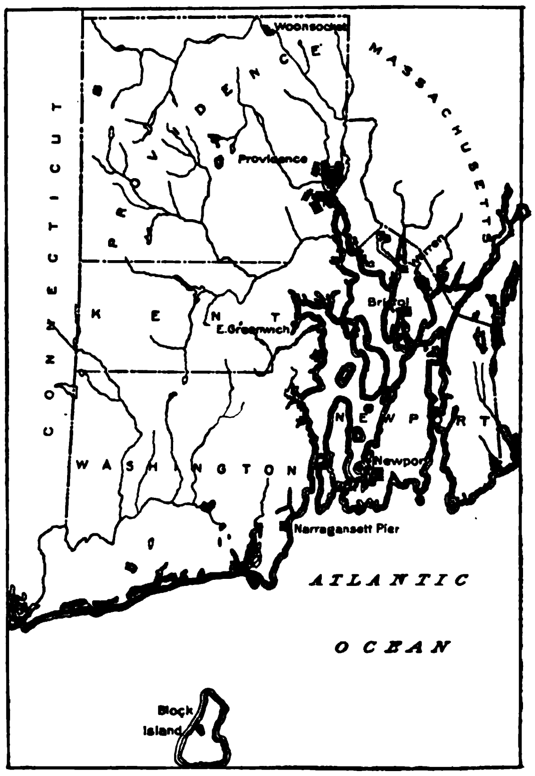
At present the growing of vegetables, both in the field and under glass, is the most highly developed horticultural industry. The towns of Cranston and Warwick are the center of this industry, where the soils are light sandy loams which are capable, under the skilful management they receive, of producing large crops of excellent quality.

The following figures, which are taken from the State Census for 1895, give some idea as to the extent of the market-garden industry for that year: Green corn, 1,138,983 doz.; tomatoes, 106,259 bushels; cucumbers, 66,268 bushels; lettuce, 2,852,204 heads; beans, string, 40,706 bushels; peas, green, 53,458 bushels; celery, 579,016 heads; melons, 624,980.

The greater proportion of the lettuce grown is of the hard-heading type, which is produced during the months from October to May. Over $100,000 is invested in glass for the production of this crop within a radius of five miles of the city of Providence. The greater portion of the muskmelon crop is produced upon the sandy plains of Warwick. The early crop is grown from plants which are either started in pots in the glass-houses and transplanted to the field or planted under sash in the field. The early varieties used for the crop are of the small Gem type, which always finds a ready sale at fancy prices, while the main crop, which is planted the last of May, is largely shipped in car-lots to Boston. For the main crop the large oblong type of melon is the most popular. Besides the large market-gardeners who are located near the cities, many of the farmers who live within a short distance of the manufacturing villages find there a ready and profitable market for the many vegetables which they produce, as the people found in these villages are good buyers who consume large quantities of vegetables when they have work.

During the past decade the floriculture of the state has been developing rapidly, not so much, however, in the number of establishments as in the area of glass. Where ten years ago the figures were given in hundreds, to-day they are increased to thousands of square feet. This development is especially noticeable in the towns which have a population of from 2,000 to 3,000. The carnation is still the most popular flower, although many fine roses are grown, with a steadily increasing demand for rare flowers, as orchids and forced stock, during the winter months.

There are in the state nine local nurseries. The greater part of the business is the growing of specimen plants for use in localities where immédiate effects are desired, rather than the propagation and sale of young nursery stock.



2102. County map of Rhode Island.

The fruit-growing industry is but poorly developed, only a very small proportion of the fruit consumed being produced within the state limits. Apples are grown more than any other fruit, the largest orchards being located in the northern part of the state, the fruit being more highly colored than that grown in the orchards along the coast. Baldwin, Rhode Island Greening, Roxbury Russet and Spy are planted more than other varieties. Many of the old orchards are past their prime, and there are excellent opportunities offered for the planting of profitable orchards upon the hilly and deserted farms. Among the enemies of fruit, the following are the most troublesome: apple scab, codlin-moth, curculio and maggot. The original Rhode Island Greening apple tree, still standing in the town of Foster, is shown in Fig. 2103, as it looked in 1900.

Peaches are receiving much attention at present. From orchards which are favorably located, crops are obtained two out of three years; the average for the state is about three out of five. Aside from the winter-killing of the buds, the most serious trouble is the rotting of the fruit. This trouble causes much greater losses in the towns bordering upon the salt water.

2103. Original tree of Rhode Island Greening apple, as it looked in 1900.

Pears are found growing in abundance all over the state, nearly every village lot having a few trees of the more popular varieties. There are several small commercial orchards, the principal varieties produced being the Bartlett, Bosc, Clapp, Lawrence and Sheldon.

Strawberries are produced in abundance in those towns bordering upon the eastern shore of Narragansett Bay, where they are the principal horticultural crop. The majority of the growers use the wide matted row. Some, however, use a very narrow row, or the hill system. This is a profitable crop to grow, as, according to the 1895 State Census, the average price received was 9½ cents per quart.

Currants, gooseberries and raspberries are grown in limited quantities, mostly for home consumption. The demand for these fruits is always greater than the supply, so that the prices obtained are always remunerative.

In Providence and Washington counties considerable attention is given to the growing of cranberries. Upon many farms are found wild bogs, to which the only care given is an occasional cutting of the wild growth to prevent its encroachment upon the bog. These bogs are usually found upon lowlands which are naturally overflowed by streams during the winter months. The most profitable bogs, however, are those which are carefully cared for and have a water supply which may be controlled at will, thus often preventing damage from late spring and early fall frosts.

At the present time excellent opportunities are offered for the growing of all kinds of fruits, to those persons who are willing to invest their capital and conduct the work upon a practical and scientific basis, as there are a number of markets which are never supplied with home-grown fruit in sufficient quantities. While it is true that fruit-growing, as an industry, is not largely developed within the state, yet it is a pleasant fact to note that excellent horticultural results are obtained by the amateur. Numerous home gardens, of small area, about many of the homes in the cities and larger villages of the state are beautiful and attractive with their artistic flower beds, varied shrubs, and fine fruit trees. G. E. Adams.

RHODE ISLAND BENT GRASS. *Agrostis canina.*

RHODOCHÌTON (Greek, *red cloak;* alluding to the large rosy red calyx). *Scrophulariàceæ.* A genus of a single species, a free-flowering, graceful vine from Mexico. Lvs. cordate, acuminate, sparsely and acutely dentate: fls. solitary, pendulous, axillary, long-peduncled; calyx conspicuous, large, membranous, broad bell-shaped, 5-cleft; corolla-tube cylindrical, the throat not personate, 5-lobed; lobes oblong, nearly equal; capsule dehiscent by irregular perforations.

volùbile, Zucc. Purple Bells. A vine with habit of Maurandia, to which it is allied, but more vigorous and having curious, distinct purplish red fls. over 2 in. long on red peduncles: lvs. about 3 in. long. B.M. 3367. B.R. 21:1755. I.H. 42:31.—Blooms the first season from seed and may be treated as a tender annual.

F. W. Barclay.

RHODODÉNDRON (Greek, *rhodon* and *dendron,* rose-tree; alluding to the beautiful flowers and the habit; the Rhododendron of the ancient writers is Nerium). *Ericàceæ.* Highly ornamental evergreen shrubs or trees, with alternate petioled, entire lvs. and terminal clusters of large, showy fls., varying in all shades of purple, scarlet, pink orange, yellow and white. None of the evergreen shrubs suitable for cultivation in colder climates are more effective in bloom than the Rhododendrons. The large clusters of showy flowers often nearly cover the entire plant, while the handsome foliage is attractive at every season (Fig. 2104).

Hardiness of the Various Species.—Although most of the species are hardy only in warm temperate regions, there are many which are hardy at least as far north as Massachusetts. They are *R. maximum, Catawbiense, Caucasicum, brachycarpum, Metternichi, Smirnowi, mucronulatum, Dahuricum, Lapponicum, ferrugineum, hirsutum, punctatum,* and probably also *chrysanthum, Przewalski, campanulatum, Californicum, Ungerni,* and *Carpaticum.* Somewhat more tender are *R. Ponticum, niveum, Hodgsoni, Thomsoni, Anthopogon.* South of Philadelphia such species as *R. cinnabarinum, glaucum, ciliatum, Fortunei, lepidotum, Colletianum,* and the Yunnan species, as *R. decorum, irroratum* and *racemosum* are probably hardy; also *R. arboreum, barbatum, Falconeri, Keysi, triflorum* and *Wrighti* in very sheltered positions. Species like *R. Dalhousiæ, Edgeworthi, Griffithianum, formosum, Maddeni, Nuttalli* and *pendulum* stand only a few degrees of frost. The Javanese species, as *R. Javanicum, jasminiflorum, Brookeanum* and *Lobbi* grow and bloom continually and stand no frost at all.

Variation in Height.—Most of the species are shrubby; a few only, and these mostly Himalayan species, grow into small or medium-sized trees, attaining 60 ft. in the case of *R. barbatum,* 40 ft. in *R. grande* and *arboreum,* 30 ft. in *Falconeri* and *maximum.* A number of northern and alpine species always remain dwarf, as *R. ferrugineum, hirsutum, Lapponicum, virgatum, lepidotum, racemosum,* and others. A few Himalayan and Malayan species are often epiphytal and grow on branches of large trees like orchids; e.g., *R. Dalhousiæ, pendulum, Nuttalli* and most of the Malayan species.

Their Place in Ornamental Planting.—Rhododendrons are equally effective and desirable for single specimens on the lawn or when massed in large groups, and are especially showy when backed by the dark green foliage of conifers, which at the same time afford a most advantageous shelter. The dwarf species, which are mostly small-leaved and flower at a different time, should not be grouped with the large-leaved ones, as they do not harmonize with them; however, they are exceedingly charming plants for rockeries or in groups with other smaller evergreens. It is certainly true that the Rhododendrons have not yet received the attention they deserve. They are still far from being as popular as they are in England. The beautiful Himalayan species and their numerous hybrids especially are still almost unknown in this country, although without doubt they could be grown as well outdoors in the middle and southern Atlantic States as they are in England, if the right situation were selected. Formerly it was considered impossible to grow the beautiful hardy hybrids in the New England states, but now it has been shown by such splendid collections as those of Mr. H. H. Hunnewell at Wellesley, Mass. (see A. F. 13:24–31 and Gng. 5:375–377), that, even in a trying climate, they can be grown to perfection if the right situations are selected and the right way of cultivation is followed.

Outdoor Cultivation.—The selection of a suitable situation is of foremost importance. If possible the beds should be sheltered against drying winds and the burning sun by tall conifers, but the shelter should be always light and natural, as too much shelter by dense hedges or walls close to the plants is worse than no shelter at all. Any open, well-drained soil which does not contain limestone or heavy clay and has a moist and fresh subsoil will prove satisfactory. Where limestone or heavy clay prevails, beds must be specially prepared and filled with suitable soil. They should be at least 2 to 3 ft. deep, or deeper where the subsoil is not porous, and in this case the bottom should be filled in about 1–2 ft. high with gravel or broken stones for drainage. A mixture of leaf-mold or peat and sandy loam will make a suitable soil. In dry spells during the summer, watering is necessary if the subsoil is not very moist; it is most essential that the soil never become really dry. In the fall the ground should be covered with leaves, pine needles, hay or other material to protect from frost. This mulch should be allowed to remain during the summer, especially where the plants are not large enough to shade the ground. An occasional top-dressing of well-decayed stable or cow manure will prove of much advantage. The ground should never be disturbed, as the roots are very near the surface. After flowering. the young seed-vessels should be removed. The Rhododendrons are easily transplanted either in spring or in fall, especially if they grow in peat or turfy loam, and a good ball of earth can be preserved in moving. They should be planted firmly, especially in porous, peaty soil, and thoroughly watered after planting. If they are carefully handled they are not much affected by transplanting, and tender kinds may be dug in fall, heeled-in in a frost-proof pit, and planted out again in spring. Potted and well-budded plants transferred in January into a temperature not exceeding 60° will develop in about six to eight weeks into very attractive and showy specimens for decoration.

Hardy Varieties.—The following varieties have proved hardy in the vicinity of Boston and may be recommended for planting in similar climates and for experimental trial farther north. They are mostly hybrids of *R. Catawbiense* with *R. maximum*, *Ponticum*, *Caucasicum* and with some infusion of *R. arboreum* and perhaps a few other species. As in most of them the parentage of *R. Catawbiense* is the most predominant, they are all usually called "Catawbiense Hybrids." Choice kinds are: *Album elegans*, blush, changing to white; *Album grandiflorum*, blush, changing to white: fls. larger, less spotted; *Alexander Dancer*, bright rose, paler in center; *Atrosanguineum*, rich blood-red; *August Van Geert*, bright carmine, spotted dark purple; *Bacchus*, crimson, large fls.; *Bicolor*, purplish pink, spotted; *Blandianum*, rosy crimson; *Caractacus*, deep crimson; *Charles Bagley*, cherry-red; *Charles Dickens*, dark red, spotted brown, one of the most striking red ones; *Cærulescens*, pale lilac; *Coriaceum*, white, spotted yellow, dwarf and free-blooming; *Crown Prince*, carmine spotted greenish yellow; *Delicatissimum*, blush, edged pink, changing to almost white, late; *Everestianum*, rosy lilac with crisped edges, excellent habit and very free-flowering; *F. L. Ames*, white center, edged pink; *Giganteum*, bright rose, large clusters; *Grandiflorum*, clear rose; *Hannibal*, rosy carmine: *Henry W. Sargent*, crimson, large clusters; *H. H. Hunnewell*, rich crimson; *John Waterer*, dark crimson; *J. D. Godman*, carmine, distinctly spotted; *Kettledrum*, rich crimson; *King of Purples*, purple, spotted dark brown; *Lady Armstrong*, rose-red, paler in center, distinctly spotted; *Lady Gray Egerton*, delicate lilac, spotted greenish brown; *Mrs. C. S. Sargent*, similar to Everestianum, but pink; *Mrs. Milner*, rich crimson; *Old Port*, plum-color; *Purpureum crispum*, lilac-purple, spotted greenish; *Purpureum grandiflorum*, purple, large clusters; *Roseum elegans*, rosy lilac, dwarf; *Sefton*, deep maroon, large clusters; *Wellesianum*, blush, changing to white.

Greenhouse Culture.—The most successful way, especially with the taller-growing species, like *R. arboreum*, *Griffithianum*, *barbatum* and *Falconeri*, is to plant them out in a porous peaty soil provided with good drainage. If grown in pots a sandy compost of leaf-soil and peat, with an addition of some fibrous loam, will suit them. The pots, which should never be too large, must be well drained and the plants freely watered during the summer, while during the winter water must be carefully applied. The Himalayan species and their hybrids will do well in a cool greenhouse, where the temperature is kept a few degrees above freezing point during the winter. The Javanese species and hybrids, however, on account of their continual growing and blooming, require a warmer greenhouse and must have a minimum temperature of 50° during the winter. They like a moist atmosphere and should be freely syringed in warm weather. In potting them, their epiphytal habit must be borne in mind, and the soil should consist mainly of good fibrous peat broken into pieces, with a liberal addition of sand and broken charcoal. The soil should never be allowed to become dry. They are readily propagated by cuttings with bottom heat in the warm propagating house. The Javanese Rhododendrons are especially valuable for their continual blooming during the winter and the brilliant color of their flowers. A large number of beautiful hybrids have been raised; the following are a small selection of them: *Balsaminæflorum*, with double white, yellow or pink fls. Gt. 37, p. 265. G.C. II. 18:230; Ill. 12:769; *Brilliant*, brilliant scarlet; *Ceres*, tawny yellow. Gn. 41:845; *Diadem*, orange-scarlet; *Duchess of Connaught*, vermilion-red; *Duchess of Edinburgh*, scarlet with orange-crimson. F. M. 1874:115; *Eos*, scarlet-carmine. G.C. III. 19:327; *Exquisite*, large light fawn-yellow fls. Gn. 56:1232; *Favorite*, satiny rose; *Jasminiflorum carminatum*, deep carmine. Gn. 41:852; *Little Beauty*, fls. small, but bright carmine-scarlet. Gn. 56:1241; *Lord Wolseley*, bright orange-yellow, tinted with rose at the margins; *Maiden's Blush*, blush with yellowish eye. Gn. 16:204; *Princess Alexandria*, white, faintly blushed; *Princess Frederica*, yellow, faintly edged rose; *Princess Royal*, pink; *Rosy Morn*, bright pink. Gn. 42:871; *Taylori*, bright pink with white tube. F.M. 1877:242; *Triumphans*, crimson-scarlet.

Propagation.—All Rhododendrons are easily prop. by seeds, which are very small and are sown in spring in pans or boxes well drained and filled with sandy peat. Pots should be well watered previous to sowing. The seeds should be covered only a very little with fine sand or finely cut sphagnum, or merely pressed in and not covered at all. To prevent drying a glass plate may be placed over the pan or some moss spread over the surface; this, however, must be taken off as soon as the seeds begin to germinate. The seeds also germinate very readily if sown in fresh sphagnum, but in this case they must be pricked off as soon as they can be handled. In any case, it is of advantage to prick off the young seedlings as soon as possible, but if they are not sown too thickly they may remain in the seed-boxes until the following spring. The seedlings of hardy Rhododendrons should be placed in coolframes and gradually hardened off; those of greenhouse species remain under glass.

2104. A good plant of Garden Rhododendron in bloom.

Rhododendrons are also sometimes increased under glass by cuttings of half-ripe wood taken with a heel, and if gentle bottom heat can be given after callusing it will be of advantage. They root, however, but slowly, except those of the Javanese kinds, which are mostly propagated in this way, since they grow very readily from cuttings.

Layering is sometimes practiced, especially with the dwarf and small-leaved species, but the layers usually cannot be separated until the second year.

2105. Azalea Sinensis, to contrast with Rhododendron.

For the propagation of the numerous varieties and hybrids of hardy and half-hardy Rhododendrons grafting is most extensively employed. *Rhododendron Catawbiense* or seedlings of any of its hardy hybrids may be used as stock; *R. maximum* is also probably as good. In English and Belgian nurseries *R. Ponticum*, which is inferior in hardiness, is mostly employed as a stock, but this often proves fatal if the grafted plants are transferred to colder climates. *R. arboreum* may be used for strong-growing varieties intended for cultivation in the greenhouse or south. Veneer- or side-grafting is mostly practiced, and sometimes cleft- and saddle-grafting (see G.C. III. 24:425). The leaves should be removed only partly and the stock not headed back until the following year. The grafting is usually done late in summer or early in spring in the greenhouse on potted stock without using grafting wax, and the grafted plants kept close and shaded until the union has been completed. If large quantities are to be handled the plants are sometimes not potted, but taken with a sufficient ball of earth, packed close together and covered with moss. Covering with moss to keep the atmosphere moist is also of much advantage if the plants are potted. See Figs. 2107, 2108.

Distribution of Species. — About 200 species are known, distributed through the colder and temperate regions of the northern hemisphere; in tropical Asia they occur in the mountains and extend as far south as New Guinea and Australia, the greatest segregation being in the Himalayas and E. Asia; several species closely allied to those of the Malayan Archipelago are found in the Philippine Islands, but are not yet introduced; 7 species occur in N. America. The species, with few exceptions, are evergreen.

Generic Description.—Lvs. lepidote, sometimes lepidote and pilose, or quite glabrous or tomentose beneath: fls. pedicelled, in terminal umbel-like racemes, rarely lateral in 1- to few-fld. clusters; calyx 5-parted, often very small; corolla rotate-campanulate to funnel-shaped or sometimes tubular, with 5-10-lobed limb; stamens 5-20, usually 10: ovary glabrous, glandular, tomentose or lepidote, 5-10-loculed: capsule separating into 5 valves containing numerous minute seeds. The Rhododendrons possess but few economic properties. The hardy close-grained wood of the arborescent species is used for fuel; also for construction and for turnery work; the leaves of some species are sometimes used medicinally; those of *R. arboreum* are believed to be poisonous to cattle. The flowers of various species are sometimes made into a subacid jelly. Some authors unite Azalea with Rhododendron, but the two groups are very distinct horticulturally, however closely they may be allied botanically. Azaleas are chiefly deciduous plants (*A. Indica* mostly evergreen), usually with 5 exserted stamens. Fig. 2105, *Azalea Sinensis*, also known as *Rhododendron Sinense*, shows the difference in looks between the two groups.

Hybrid Rhododendrons. — Many hybrids have been raised and they are now more extensively cultivated than the original species. The first hybrid was probably the one raised from *R. Ponticum*, fertilized by a hardy Azalea, probably *A. nudiflora;* it originated about 1800, in the nursery of Mr. Thompson, at Mile-end, near London, and was first described and figured as *R. Ponticum*, var. *deciduum* (Andrews, Bot. Rep. 6:379). Many hybrids of similar origin were afterwards raised. The first hybrid between true Rhododendrons was probably a cross between *R. Catawbiense* and *R. Ponticum*, but it seems not to have attracted much attention. It was by hybridizing the product of this cross with the Himalayan *R. arboreum* introduced about 1820 that the first plant was raised which became the forerunner of a countless number of beautiful hybrids. From the appearance of this cross obtained about 1826, at Highclere, in England, and therefore called *R. Altaclarense*, the era of Rhododendron hybrids is to be dated. Figs. 2104 and 2106 are common hybrid forms. A second era in the history of the Rhododendron may be dated from the introduction of a large number of the beautiful Sikkim Rhododendrons about 1850 and of the Javanese species shortly afterwards. A third era will perhaps be traced from the recent introduction of the Yunnan Rhododendrons. ALFRED REHDER.

HARDY RHODODENDRONS.—Rhododendrons, in this article, mean the evergreen sorts, more particularly *R. maximum* and the hybrid varieties of *R. Catawbiense:* in the main, however, the directions for the various operations apply to the Azalea group and to many other members of the heath family.

Propagation.—Rhododendrons are increased by seeds, layers and grafts, and occasionally by cuttings. Seeds should be sown under glass, between January 1 and March 15, in soil one-half peat, one-half pure fine sand, with good drainage. The seeds are small and require no covering, the usual watering after sowing being quite sufficient. A thin layer of sphagnum over the surface of the seed-pan is good protection from the sun and keeps the soil evenly moist; it should be removed when germination begins. Seeds may also be sown on growing sphagnum, a thin layer being compactly spread above the seed soil and drainage, and an even surface being secured by clipping. Seed-pans or flats of convenient size are used and they should be plunged in sphagnum still further to insure even moisture: the temperature of the house should be 45°-50° F. Seedlings are prone to damp-off and should be pricked-off into fresh soil as soon as they are big enough to handle; wooden pincers, made from a barrel hoop, are handy for this work. They are slow growers and must be tended carefully. Keep under glass, well shaded until the weather is settled. Frames with lath screens make good summer quarters. Winter in pits and plant out in frames in peaty soil when large enough. Never let them suffer from dryness. It has been suggested that the seed of *R. maximum* might be planted on living moss under high-branched trees in swamps where the water does not collect in winter. See Jackson Dawson, on the "Propagation of Trees and Shrubs from Seeds," Trans. Mass. Hort. Soc., 1885, part 1, p. 145.

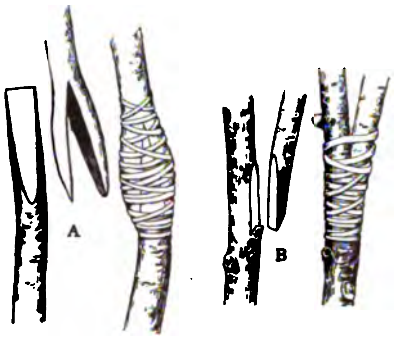
Layers probably make the best plants, and in the best English nurseries layering is the common method of propagation. With us layering in spring is preferable, but abroad it is practiced in both spring and autumn. It is a slow process, but desirable for the hardy hybrids of *R. Catawbiense*. Roots form on wood of almost any age; when removed the layers should be treated as rooted cuttings and carefully grown in well-prepared soil where water and shade are easily furnished. See *Layering*. See, also, G.F. 6:63 (1893) for an interesting account of layering large plants by burying them to the top.

Grafting is the common method of propagation, and is employed almost universally in continental nurseries. *R. Ponticum* is the usual stock, a free grower and readily obtained from seeds. Attempts have been made to use *R. maximum* in American nurseries, because of the tenderness of *R. Ponticum*, but no great progress has been made. It is asserted that the rate of growth is somewhat slower than that of the hybrids; this seems hardly possible, and it is to be hoped that further experiments will be made. *R. Ponticum* should be established in pots in spring and grafted under glass in autumn and early winter, using the veneer-graft (see *Graftage*, p. 664, Vol. II). Graft as near the root as possible and plant the worked parts below the surface when planting in the nursery or permanently. With these precautions, and an extra covering of leaves until the plant is established on its own roots, the defect of tenderness in this stock can be overcome. Nurse carefully the young grafted plants in frames until of sufficient size to be planted in the nursery rows. Figs. 2107 and 2108 illustrate two common methods of grafting Rhododendrons and other woody plants. The details of the unions are shown in Fig. 2107, and the completed work in Fig. 2108.

Statements are made that cuttings of half-ripened wood will strike, but it is not likely that this will ever prove a practical method of propagating *R. maximum* or the *Catawbiense* hybrids: it might be worth while to experiment with wood grown under glass, particularly with some of the smaller-leaved evergreen kinds.

Cultivation.—The point upon which the successful American growers of Rhododendrons now insist is that the water supply shall be sufficient. See H. H. Hunnewell, in G. F. 3:201 (1890). To effect this: (1) make the soil deep and fine, using materials like peat, leaf-mold, well-rotted manure and yellow loam, all of which are retentive of moisture; (2) plant in masses, at any rate while young, so that they may protect each other and prevent evaporation; (3) give the bed a northern exposure or a situation where the force of the midday sun is broken; (4) do not plant under or near trees like elm, oak or maple which make undue inroads on the natural water supply, nor so near buildings that the border is sheltered from rain or overdrained by cellar walls; (5) mulch with leaves summer and winter, protect from wind and sun with evergreen boughs in winter and in summer give heavy watering whenever the weather is excessively hot or dry.

2106. A common hybrid form of Garden Rhododendron.

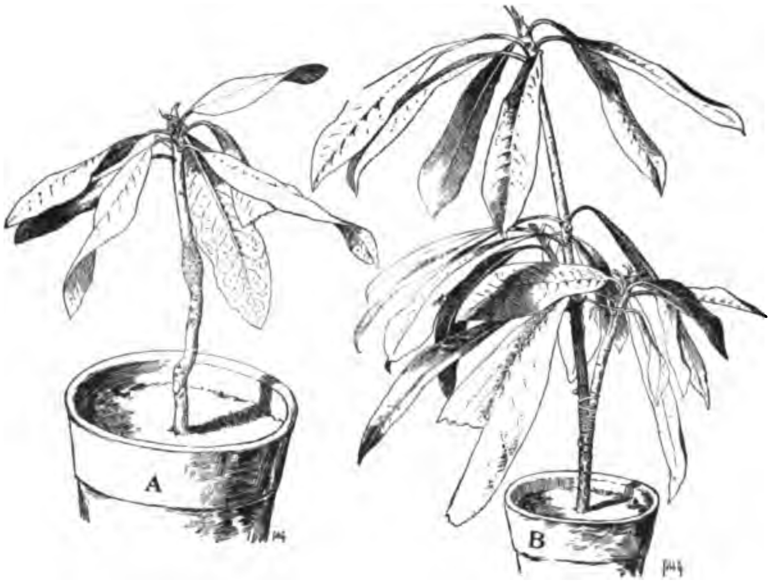


2107. Grafting of Rhododendron.
Saddle-graft at A; veneer-graft at B.

Soil.—The bed should be prepared by excavating to the desired dimensions and at least three feet deep. The poor material should be discarded, but the good soil can be replaced, adding enough peat, etc. (see above) to make good that which was rejected: all should be thoroughly and carefully mixed. Peat, although excellent, is not necessary. Yellow loam or hazel loam, if not too sandy, is equally good and is improved by additions of humus. To nearly pure peat an admixture of sand is beneficial; the essential point is that all soils for these plants must be fine. The beds should be prepared in autumn and left to settle all winter, due allowance being made for shrinking. In spring level off to the grade of the adjacent land and do not leave "rounded up." A bed higher at the center than at the sides perhaps makes a better display of the plants, but it is more likely to dry up and does not catch all the water possible from occasional showers. It is generally conceded that lime soils and manures containing lime, e.g., wood ashes and bone meal, are injurious to Rhododendrons; in limestone regions it is undoubtedly advisable to substitute, for the natural soil, others which are free from this objectionable element.

Planting.—Plant in spring when the weather is settled and the March winds have passed. If the ball of roots is dry, soak well before setting. Plant closely, so that the tops are only 10–12 in. apart and pay particular attention to "facing" them, i. e., see that the best side is facing the most important point of view and that all are faced alike. Grafted plants should, if possible, have the worked portion below the surface. Do not plant in autumn. Plants grown on the premises may be transplanted in favorable weather in summer if great care is taken to prevent the roots suffering from dryness. In planning the original border it is well to leave room for extension: when planted, as described above, the beds can be enlarged at intervals of four or five years, or new beds made from the old stock. Place the beds so that the glare of the midday sun is screened both summer and winter, and avoid situations where there is any interference, owing to trees or buildings, with a naturally good condition of the soil in respect to moisture. If permanent protection is desired, use conifers, particularly the hemlock, in preference to deciduous trees. Good positions for beds may be found along the edges of ponds and streams, and in reclaimed meadows, with their cool moist soil, but keep aloof from any ground where the water collects in summer or winter. Beds, or even single plants, if sizable, may be introduced into open spaces in woodlands if the precautions noted above are observed and plenty of air and light are obtainable. It is somewhat difficult to combine Rhododendrons and many deciduous shrubs, among which are the Azaleas, their near relatives. A background of dark green conifers seems most appropriate. Mountain Laurels, *Pieris floribunda*, *Leucothoë Catæsbæi* and *Daphne Cneorum* are proper companions, but at times these seem better apart. Our native lilies, *L. superbum* and *L. Canadense*, are good associates and thrive under the same conditions.

In hot, dry weather water should be given, not daily in driblets, as lawns are sprinkled, but in quantity, enough at one time to soak the border to the depth of the soil, but at comparatively infrequent intervals, once a week or so. The bed should also be mulched with leaves, or other material, to prevent evaporation; grass clippings are serviceable, but should not be used in large quantities at any one time or else they will heat. Leaves make good winter protection, which should be given just before cold weather,—here, in eastern Massachusetts, between Thanksgiving and Christmas. Let the bed be covered to the depth of 10–12 in., well worked in beneath the foliage but not over it. In spring dig as much as possible of this material into the ground, reserving a part for the summer mulch. Shelter the tops with evergreen boughs, the butts driven into the earth a foot or more deep; in very windy positions a temporary board fence is useful. Neither boughs nor fence should be removed until all danger from high winds has passed.



2108. Saddle-graft at A; veneer-graft at B. For comparison with Fig. 2107.

Rhododendrons require no pruning unless injured or when ill-grown plants must be made shapely; they break easily when cut back, even if the wood be aged. As yet no insect pest or fungous disease of importance has appeared.

Varieties.—The following Hardy Rhododendrons, hybrids of *R. Catawbiense*, were sent to the Arnold Arboretum in 1891 by Mr. Anthony Waterer, Knap Hill Nursery, Woking, Surrey, England. Their hardiness has been proved by a ten years' test. In flower, foliage and growth they leave nothing to be desired: it is impossible to give them too great praise. For additional lists, see Garden and Forest as quoted above and in other articles in the same journal. The brief descriptions are taken from Mr. Waterer's catalogue, from which further details can be obtained; almost all these varieties originated in his establishment.

Album elegans, blush changing to white, one of the best; *Album grandiflorum*, blush, fine truss; *Alex. Dancer*, bright rose; *Atrosanguineum*, intense blood-red; *Bicolor; Bluebell*, blush; *Caractacus*, purple-crimson; *Catawbiense album*, white; *Chas. Bagley*, cherry-red; *Chas. Dickens*, dark scarlet; *C. S. Sargent*, bright scarlet, fine truss; *Cærulescens*, blush; *Coriaceum*, white; *Delicatissimum*, white, pink edge; *Edw. S. Rand*, scarlet; *Everestianum*, rosy lilac, fringed, one of the best; *F. D. Godman*, crimson, fine blotch; *F. L. Ames; Glenyanum; Giganteum*, bright rose; *Guido*, deep crimson; *Hannibal*, rose, late; *Henrietta Sargent*, pink; *H. H. Hunnewell*, dark crimson, fine truss; *H. W. Sargent*, crimson; *Jas. Bateman*, rosy scarlet; *Jas. MacIntosh*, rosy scarlet; *Kettledrum*, purplish crimson; *King of Purples*, fine habit; *Lady Armstrong*, pale rose, beautiful; *Lady Grey Egerton*, silvery blush, splendid truss, extra; *Marion; M. H. Sutton*, scarlet, fine; *Maximum Wellsianum*, blush, late; *M. T. Masters*, rosy crimson; *Melton*, rich purple; *Miss Mary Ames*, fine habit, crimson; *Mrs. A. Hunnewell*, pink; *Mrs. Chas. Sargent*, pink; *Mrs. H. Ingersoll*, rosy lilac; *Mrs. Milner*, crimson; *Norma; Purpureum elegans; Purpureum grandiflorum; Ralph Sanders*, purple-crimson; *Roseum elegans; R. S. Field*, scarlet; *Sefton*, dark maroon, extra.

B. M. WATSON.

RHODODENDRONS NEAR BOSTON.—In the vicinity of Boston there are many notable instances of the successful use of Rhododendrons in greater or less quantity. The estate of the late Francis B. Hayes, of Lexington, Mass., and that of H. H. Hunnewell, at Wellesley, Mass., are perhaps as notable examples as any, although other examples could be cited by the score of fine estates in which plantings of Rhododendrons have been prominent features. The success that has attended these plantings has been brought about very largely through most expensive experiment whereby a great number of named varieties have been originally imported on the basis of experiment with a view to proving what the hardy kinds might be. The hybrids of *Rhododendron Catawbiense* and *R. Ponticum* are the principal varieties that have been planted, and extensive trials with their consequent numerous failures have established the fact that the following eighteen varieties can well be stated to be the hardy varieties for the climatic conditions peculiar to this vicinity: Album elegans, Album grandiflorum, Atrosanguineum, Caractacus, Charles Bagley, Charles Dickens, Delicatissimum, Everestianum, Giganteum, Hannibal, H. H. Hunnewell, James Bateman, Lady Armstrong, Lee's Purple, Old Port, Purpureum, Purpureum grandiflorum, Roseum elegans.

The list noted above constitutes the iron-clad varieties for the vicinity of Boston. The expression "iron-clad" does not, however, indicate that these varieties can be promiscuously planted without proper attention to their requirements. That Rhododendrons do succeed under conditions of comparatively poor soil and exposure is not an indication that they are happy under such conditions. Rhododendrons must have the proper conditions of soil, exposure and moisture in order to give the most satisfactory returns in growth and flower. Soil conditions do not necessarily involve an extended outlay in preparation, provided the original soil is of a good, ordinary composition such as would maintain common garden products to good advantage, but it is desirable to add 25 per cent of well-rotted leaf-mold, thus providing that peculiar humus that the Rhododendron seems best to thrive in. On the other hand, care must be taken that this percentage is not largely increased, as frequent instances arise where beds have been prepared with too large a percentage of leaf-mold, with the result that where the beds have once dried out the texture of the soil becomes like that of a very dry sponge. When the soil is in such condition it is impossible to wet it down artificially in a satisfactory manner. The exposure need not necessarily be confined to sheltered locations, provided soil conditions are sufficiently favorable to maintain a vigorous and healthy growth. Fertilizers can be applied to Rhododendrons to increase the after-growth, although it is not desirable that they be applied directly to the roots. Stable manure should perhaps never be worked through the soil until it has been allowed to thoroughly weather by being first applied as a mulch on the surface of the ground. Here, again, it is essential that care be taken in working in such fertilizer that it be done in such a manner that the fine, fibrous roots of the Rhododendron which are so close to the surface of the soil be not seriously disturbed. It is perhaps better to leave the fertilizer as a mulch on the surface of the ground without attempting to work it generally into the soil. During the winter months a raking of leaves should be worked through the beds to a depth of six inches to a foot, and it is better that the gardener be not over-particular in raking away these leaves in the spring, leaving the bare surface of the ground exposed, with the consequent injury to the surface roots of the Rhododendron through drought conditions. Where it is possible to provide a somewhat shaded location with an eastern or northern exposure the Rhododendron will succeed better than under conditions of southern or western exposure. A southern exposure necessitates careful shading of the plants throughout the winter in order to prevent injury from alternate freezing and thawing in the late winter months or by blasting of the flower-buds through too early growth with its consequent injury from late spring frosts. When massed against a background of evergreens the Rhododendron perhaps shows to its best advantage, but with the use of the taller-growing varieties they make tall, showy banks of Rhododendrons alone. The greatest cause for disappointment in the use of the imported Rhododendron occurs through lack of discrimination in the selection of varieties and also in the manner of propagation of these varieties. Rhododendrons grafted on *Rhododendron Ponticum*, a native of southern Europe and Asia Minor, cannot be depended on for best success, as no matter how hardy the top of the plant may be, unless the junctions of the graft are below the surface of the soil so that the stalk itself is protected, nothing but disappointment can result, since the roots of the plant are killed and there is nothing from which the top can draw nourishment. So far as possible varieties must be selected that are either grown from layers or worked on some perfectly hardy stock, such as *Rhododendron maximum* or *R. Catawbiense*. *R. Catawbiense* and its various forms have constituted the main part of the plants that have been imported, while the *R. maximum* has until lately been practically lost sight of, though the fact remains that for many years *R. maximum* has contributed to the establishment of a class of hardy forms such as the variety Delicatissimum, in which one finds the vigor of growth and size of foliage indicative of the Maximum parentage, while the abundance of bloom and color can be traced to that other parent, *R. Catawbiense*. Some other varieties are in commerce that have had similar hardy parentage, and some seedlings are known in this country which combine great merits but which up to the present time have not been offered or propagated largely. Among these could be mentioned the variety "James Comley," a seedling originated by James Comley on the estate of Francis B. Hayes, of Lexington, for which the Massachusetts Horticultural Society awarded a silver medal in 1898. The great objection to the use of Hybrid Rhododendrons has been their cost and the length of time that was necessary to wait for the smaller plants to make satisfactory height for producing landscape effects. Consequently, the landscape architects of recent years have sought a variety of Rhododendron that would combine vigor of growth, blooming quality and perfect hardiness. Experiments made with collected plants of *R. maximum* taken from various localities have proved that this plant is practical for such purposes; and the outcome of such experiments has been that such large private estates as those of William Rockefeller, W. L. Elkins, Mrs. Eliot F. Shepard, and others, have very largely been stocked with collected plants of *R. maximum*, supplied in car-load lots and in sizes ranging from 8-foot bushy specimens down to small plants that could be grown on for future flower and foliage effects. These plants are taken from localities where the plants are growing either in the open or under moderate shade conditions and have been pruned by the natural process of fire, resulting in a vigorous growth of a more or less bushy and compact nature and growing in soil of sufficient richness to assure their digging with a large amount of clinging earth. With proper care in transportation and after-cultivation the results show a surprisingly small loss of plants. Plants collected under these ideal conditions give entirely satisfactory results, but so far as these conditions of careful digging, packing, transportation and after-culture are violated, the results are correspondingly less satisfactory.

The areas from which the plants can be collected under the conditions mentioned above are very restricted and soon become exhausted of the plants. There seems to be no limit to the size of the plants that can be transplanted with success, as broad masses 12 feet high and as much in diameter frequently are moved and show practically no set-back in the transplanting.

J. WOODWARD MANNING.

INDEX.

For many other names, see supplementary list.

æruginosum, 10.
album, 3, 4, 6, 12, 14 and suppl.
arbutifolium, 15.
arboreum, 6.
atrovirens, 19.
azaleoides, 5.
Batemani, 10.
brachycarpum, 8.
Californicum, 1.
campanulatum, 10.
Catawbiense, 2.
Caucasicum, 7.
cinnamomeum, 6.
Dahuricum, 19.
daphnoides, 15.
ferrugineum, 12.
flavidum, 7.
fragrans, 5.
Hammondi, 15.
hirsutum, 13.
jasminiflorum, 11.
Keiskei, 17.
Kingianum, 6.
limbatum, 6.
maximum, 3, 5.
Metternichi, 9.
minus, 14.
mucronulatum, 18.
myrtifolium, 16 and suppl.
Nilagiricum, 6.
odoratum, 5.
oleæfolium, 15.
ovalifolium, 16.
ovatum, 16.
Ponticum, 4.
præcox, 20.
punctatum, 14.
puniceus, 6.
purpureum, 3.
Purshii, 3.
roseo-album, 7.
roseum, 3.
sempervirens, 19.
splendens, 7.
stramineum, 7.
Wallichi, 10.
Washingtonianum, 1.
Wilsoni, 15.
Windsorii, 6.

A. *Foliage and ovary not lepidote: buds with many imbricate scales. Eurhododendron.*

B. *Lvs. glabrous beneath or only pubescent when young.*

C. *Plants with coriaceous, persistent lvs.*

D. *Pedicels glabrous*........ 1. **Californicum**

DD. *Pedicels pubescent or glandular.*

E. *Under side of lvs. whitish.*

F. *Calyx-lobes much shorter than ovary.* 2. **Catawbiense**

FF. *Calyx-lobes about as long as ovary*..... 3. **maximum**

EE. *Under side of lvs. pale green*................ 4. **Ponticum**

CC. *Plants with lvs. rather thin, falling off the second spring, 2–3½ in. long* ..... 5. **azaleoides**

BB. *Lvs. tomentose or pubescent beneath.*

C. *Young branches and ovary tomentose.*

D. *Shrub attaining 25 ft. in height, or tree becoming 40 ft.: plant half-hardy.* 6. **arboreum**

DD. *Shrub, 2–4 ft. high, rarely 10 ft. high: plant hardy.*

E. *Corolla 5-lobed, spotted greenish.*

F. *The lvs. acute at both ends*.............. 7. **Caucasicum**

FF. *The lvs. obtuse at both ends*......... 8. **brachycarpum**

9. **Metternichi**

EE. *Corolla 5–7-lobed, spotted purple.*

CC. *Young branches, pedicels and ovary glabrous*............10. **campanulatum**

AA. *Foliage lepidote or glandular, rarely more than 3 in. long: ovary lepidote. Lepidorhodium.*
  B. *Corolla with cylindric tube, thrice as long as lobes*.......11. **jasminiflorum**
  BB. *Corolla campanulate or funnelform; lobes as long or twice as long as tube.*
    C. *Lvs. persistent; corolla lepidote outside.*
      D. *Style hardly twice as long as ovary, shorter than stamens: lvs. often slightly crenulate.*
        E. *The lvs. without hairs*.12. **ferrugineum**
        EE. *The lvs. ciliate*........13. **hirsutum**
      DD. *Style at least thrice as long as ovary.*
        E. *Fls. pink or white*.....14. **punctatum**
15. **arbutifolium**
16. **myrtifolium**
        EE. *Fls. pale yellow*.......17. **Keiskei**
    CC. *Lvs. deciduous or semi-persistent: corolla not lepidote outside: fls. very early in spring from lateral 1-fld. buds at the ends of branches*..................18. **mucronulatum**
19. **Dahuricum**
20. **præcox**

1. **Califórnicum**, Hook. Shrub, 8 ft. high, sometimes to 20 ft., glabrous: lvs. oblong, shortly acuminate, pale green beneath, 3–6 in. long, sometimes crowded beneath the fls.: clusters many-fld.: calyx minute; corolla broadly campanulate, with oval crisped lobes, rosy purple or pink, paler towards the center, spotted yellow within, about 2 in. across, rich carmine in bud; stamens 10, with purple anthers: ovary with appressed silky hairs. May, June. Calif. to Ore. B.M. 4863.—Var. **Washingtoniànum**, Zabel (*R. Washingtonianum* and probably *R. Californicum*, var. *maximum*, Hort.), is not much different, but has yellow anthers; it has proved as hardy as *R. Catawbiense*.

2. **Catawbiénse**, Pursh. Figs. 2109, 2110. Shrub, 6 ft. high, rarely 20 ft.: lvs. rounded at base, oval to oblong, usually obtuse and mucronulate, glaucous beneath, 3–5 in. long: clusters many-fld.; pedicels rusty pubescent: corolla broadly campanulate, with broad roundish lobes, lilac-purple, about 1½ in. across: ovary rusty tomentose. June. Va. to Ga., in the mts. B.M. 1671. L.B.C. 12:1176.—One of the most beautiful of native shrubs, covering extensive tracts of land in the southern Alleghanies. Hardy as far north as New England.

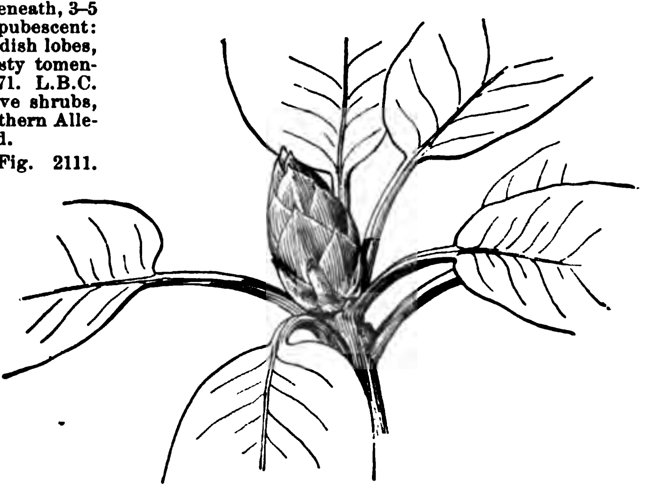
3. **máximum**, Linn. GREAT LAUREL. Fig. 2111. Shrub or small tree, attaining 35 ft.: lvs. mostly acute at base, narrow-oblong or lanceolate-oblong, acute or shortly acuminate, whitish beneath, 4–10 in. long: clusters many-fld.; pedicels viscid: calyx-lobes oval, as long as ovary; corolla campanulate, deeply 5-lobed with oval lobes, usually rose-colored, spotted greenish within, about 1½ in. across: ovary glandular. June, July. N. S. and Ont. to Ga. B.M. 951. Em. 2:435. Mn. 1:1 and 3, p. 22. D. 16.—This is one of the hardiest species, being hardy as far north as Quebec and Ontario. Three vars. have been distinguished: var. **álbum**, Pursh (*R. Púrshii*, Don), with white fls.; var. **purpùreum**, Pursh (*R. purpùreum*, Don), with purple fls., and var. **ròseum**, Pursh, with pink flowers. This species and the former are now often extensively used in park-planting and taken by the car-loads from the woods. If properly handled and taken from a turfy soil with a sufficient ball of earth around the roots, they are usually successfully transplanted.

4. **Pónticum**, Linn. Shrub, 10 ft. high: lvs. elliptic to oblong, acute, pale green beneath, 3–5 in. long: clusters many-fld.; pedicels longer than fls.: calyx-lobes as long as ovary, the lower ones half as long; corolla campanulate with oval lobes, purple, spotted brownish within, about 2 in. across: ovary glandular. May, June. Spain, Portugal, Asia Minor. B.M. 650.—This species is less hardy than the two preceding and now rarely found in cultivation in its typical form. Var. **álbum**, Hort., has white flowers. There are also vars. with variegated and one with purplish leaves.

5. **azaleoìdes**, Desf. (*R. fràgrans*, Hort. *R. odoràtum*, Hort.). Hybrid between *R. Ponticum* and *Azalea nudiflora*. Shrub, a few ft. high: lvs. leathery but thin, elliptic to oblong, acute at both ends, dark green above, paler beneath, sometimes pubescent when young: fls. funnelform-campanulate, pinkish or whitish, fragrant, 1½–2 in. across; calyx with ciliate lobes. May, June. —Of garden origin. There are many allied forms of similar origin described under different names. The name Azaleodendron has been proposed as a generic name for the hybrids between Azalea and Rhododendron.

6. **arbòreum**, Smith. Fig. 2112. Large shrub or tree, attaining 40 ft.: lvs. oblong to lanceolate, acute, rugose above, distinctly veined and whitish or ferrugineous-tomentose beneath, 4–6 in. long: clusters dense, pedicels short: calyx minute; corolla campanulate, blood-red, pink or white, usually spotted, 1–1½ in. across: ovary ferrugineous-woolly or mealy, usually 7–9-celled. March–May. Himalayas. B.R. 11:890. P.M. 1:101.—Var. **álbum**, DC. (*R. álbum*, Sweet, not Blume). Fls. white, spotted purple: lvs. ferrugineous beneath. S.B.F.G. 5:148. Var. **cinnamòmeum**, Lindl. Fls. white, slightly blushed, darker spotted than the preceding: lvs. cinnamon-brown beneath. B.R. 23:1982. Var. **limbàtum**, Hook. Fls. with rosy limb and white throat, blotched purple at base: lvs. white beneath. B.M. 5311. Var. **Kingiànum**, Hook. (*R. Kingiànum*, Watt.). Shrub: lvs. broader, strongly bullate, very dark: fls. deep scarlet; filaments rose-colored; calyx larger. G.C. III. 26:306. Var. **Nilagíricum**, Clarke. Fls. rose-colored to deep crimson, spotted: lvs. ferrugineous beneath. B.M.4381. Gn. 36:710. Var. **puniceum**, DC. Fls. purple or scarlet: lvs. white beneath. Var. **Windsorii**, Voss (*R. Windsorii*, Nutt.). Fls. deep crimson-scarlet; calyx with elongated lobes: lvs. white beneath. B.M. 5008.

7. **Caucásicum**, Pall. Dense low shrub, 2 ft. high, often with procumbent branches: lvs. oval-oblong or narrow-elliptic, acute, dark green above, ferrugineous tomentose beneath, 2–4 in. long: clusters 7–10-fld.; pedicels short: calyx minute; corolla funnelform-campanulate, with emarginate rounded lobes, pink to yellowish white, spotted greenish within, 1½ in. across. June, July. Caucasus. B.M. 1145.—A dwarf, quite hardy species; late-flowering. Var. **flàvidum**, Regel. Fls. straw-col-



2109. Flower-bud of Rhododendron Catawbiense (× ½).
These buds are full-formed in the fall. Unless these large terminal buds are produced, the bush will not bloom the following spring.

ored, spotted greenish within. Gt. 16:560. Var. **stramíneum**, Hook., is similar, but with fulvous spots. B.M. 3422. Var. **ròseo-álbum**, Briot, with blush fls., changing to white, and var. **splèndens**, Briot, with deep pink fls., are said to bloom very early and may be hybrids. R.H. 1868:311.

8. **brachycárpum**, Don. Shrub, 4 ft. high, sometimes 10 ft.: lvs. oval to oblong, rounded at both ends, mucronulate at the apex, bright green above, whitish or ferrugineous-tomentulose beneath, 2½-6 in. long: fls. in dense clusters, short-pedicelled; calyx-lobes short; corolla campanulate, creamy white, spotted greenish within, 1½-2 in. across. June. Japan. G.F. 1:293.—Has proved quite hardy, but is yet rare in cultivation.

9. **Métternichi**, Sieb. & Zucc. Shrub, 4 ft. high: lvs. oblong or oblong-lanceolate, narrowed at both ends, acute or obtuse, ferrugineous-tomentose beneath, 3-6 in. long: clusters 8-15-fld.; calyx minute; corolla campanulate, 5-7-lobed, rose-colored, spotted purple within, 1½-2 in. across; stamens 10-14. May, June. Japan. S.Z. 1:9.—Like the preceding hardy, but rare in cultivation.

10. **campanulàtum**, Don. Shrub, attaining 16 ft.: lvs. elliptic to elliptic-oblong, usually rounded at both ends, ferrugineous-tomentose beneath, 3-6 in. long: clusters many-fld.; pedicels short: calyx-lobes short; corolla campanulate, pale purple or pale lilac or almost white, with few purple spots, 2 in. across. June. Himalaya. B.M. 3759. L.B.C. 20:1944. S.B.F.G. II. 3:241. Gn. 48, p. 108.—This is one of the hardiest of the Himalayan species. Var. **æruginòsum**, Nichols. (*R. æruginosum* Hook. f.). Lvs. with verdigris-colored tomentum beneath. Var. **Bàtemani**, Nichols. (*R. Bàtemani*, Hook.). Of more robust habit and with larger flowers. B.M. 5387. Var. **Wállichii**, Hook. Lvs. with lax, often caducous tomentum, and with densely woolly petioles: corolla more highly colored. B.M. 4928.

11. **jasminiflòrum**, Hook. Small shrub: lvs. subverticillate, obovate to oblong, acute, glabrous, lepidote beneath, 1½-3 in. long: clusters many-fld.; pedicels short: calyx minute; corolla almost salver-shaped, with the tube 2 in. long and spreading limb, fragrant, white, blushed outside below the limb, the anthers forming a red eye; style shorter than stamens, included. Winter. Java, Malacca. B.M. 4524. I.H. 6:203.—A distinct species, very unlike other Rhododendrons; it requires a warm greenhouse.

12. **ferrugíneum**, Linn. Shrub, 2 ft. high, glabrous: lvs. elliptic to oblong-lanceolate, acute, densely lepidote beneath, 1-2 in. long: clusters many-fld.: calyx-lobes short; corolla funnelform-campanulate, with the tube about twice as long as limb, pink or carmine, about ½ in. across. June-Aug. Mts. of middle Eu. L.B.C. 1:65. Gn. 29, p. 358.—Dwarf, hardy shrub, handsome for rockeries. Var. **álbum**, Sweet, has white flowers. S.B.F.G. II. 3:258.

13. **hirsùtum**, Linn. Shrub, 3 ft. high, with hirsute branches: lvs. oval to oblong, ciliate, light green and glandular-lepidote beneath, ½-1 in. long: clusters many-fld.; calyx-lobes as long as ovary; corolla similar to that of the preceding, lobes shorter. June, July Alps. L.B.C. 5:479. B.M. 1853.—Much like the preceding, but usually thrives better in cultivation and does not dislike limestone soil.

14. **punctàtum**, Andr. (*R. minus*, Michx.). Shrub, 6 ft. high, with slender spreading or recurving branches: lvs. oval- or oval-lanceolate, acute at both ends, glabrous above, glandular-lepidote beneath, 2-5 in. long: clusters rather few-fld.: calyx short; corolla broadly funnelform, with obovate rounded and slightly undulate lobes, usually pale rose and spotted greenish within, about 1 in. across. June-Aug. N. C. to Ga. B.M. 2285. B.R. 1:37. Hardy.—Var. **álbum**, Hort. Fls. white.

15. **arbutifòlium**, Hort. (*R. daphnoides*, *Hámmondi*, and *oleæfòlium*, Hort. *R. Wilsoni*, Hort., not Nutt.). A hybrid of *R. ferrugineum* and *punctatum*. Dense shrub, 4 ft. high: lvs. elliptic to elliptic-lanceolate, acute at both ends, 1½-3 in. long: fls. similar to those of *R. ferrugineum*, but larger. June, July.—Of garden origin. Handsome hardy shrub, perhaps best known under the name *R. Wilsoni*; this name, however, had been given previously to another hybrid between two Himalayan species and should not be used for this form.

16. **myrtifòlium**, Lodd. (*R. ovalifòlium*, Hort. *R. ovàtum*, Hort., not Hook.). Hybrid between *R. punctatum* and *hirsutum*, much like the preceding, but lvs. generally smaller and broader, less densely lepidote beneath, 1-2½ in. long, sometimes sparingly ciliate when young: fls. longer pedicelled and calyx-lobes narrower and longer. June, July. L.B.C. 10:908.—Originated in the nursery of Loddiges

2110. Rhododendron Catawbiense (X ⅓).

17. **Keìskei**, Miq. Low, sometimes procumbent shrub: lvs. elliptic to lanceolate, acute, dull green above, lepidote beneath, 1½-3 in. long: clusters 2-5-fld.; calyx minute; corolla broadly funnelform, divided to the middle into rounded lobes, pale yellow, 1½ in. across; stamens much exserted. May. Japan.—Hardiness not yet determined.

18. **mucronulàtum**, Turcz. (*R. Dahùricum*, var. *mucronulàtum*, Maxim.). Upright shrub attaining 6 ft.: lvs. elliptic to oblong, acute at both ends, slightly crenulate, sparingly lepidote on both sides, bright green above, pale beneath: fls. 3-6, short-pedicelled; corolla funnelform, almost without tube, divided to the middle into oval rounded lobes, rose-colored, 1-1½ in. across. March, April. Dahuria, N. China, Japan. G.F. 9:65.—Hardy shrub valuable for its very early fls. (it is the earliest of all hardy Rhododendrons), and for its handsome scarlet fall coloring.

19. **Dahùricum**, Turcz. (*Azàlea Dahùrica*, C. Koch). Closely allied to the preceding but lvs. smaller, oval to oval-oblong, obtuse at both ends, revolute at the margin and ferrugineous beneath: fls. 1-3. March, April. Siber., Dahur., Camschatka. B.M. 17:636. L.B.C. 7:605. G.C. II. 17:295; III. 12:701.—Var. **sempérvirens**, Sims (var. *atrovirens*, Edw.). Lvs. dark green, almost persistent: fls. violet-purple. B.M. 1888. B.R. 3:194. L.B.C. 16:1584.

20. **prǽcox**, Carr. Hybrid between *R. ciliatum* and *Dahuricum*. Low shrub with persistent, elliptic or oval lvs., sparingly ciliate or glabrous, ferrugineous-lepidote beneath, 1-2 in. long: clusters few-fld.: calyx-lobes ovate, ciliate; corolla broadly funnelform, pale purple or lilac, 1½ in. across. March, April. Of garden origin. R.H. 1868:210. Gn. 38:761. G.C. II. 17:295; III. 12:771. Less hardy than the preceding species but handsomer. Here belongs also Early Gem, with larger pale-lilac fls. and the lvs. somewhat more ciliate. G.C. II. 9:336.

Great numbers of names of Rhododendrons are to be found in current literature, but the plants may be unknown in the American trade. The following list will explain most of these names. Some of them belong to Azalea, although they may not be accounted for under that genus in this work. *R. Afghánicum*, not Aitch. & Hemsl. = R. Collettianum.—*R. albiflòrum*, Hook. = Azalea albiflora.—*R. álbum*, Blume. Small shrub: lvs. oblong-lanceolate, ferrugineous-lepidote beneath, 3-4 in. long: fls. rather small, campanulate, yellowish white. Java. B.M. 4972. Tender.—*R. Altaclarénse*, Lindl. Hybrid of R. arboreum with R. Catawbiense X Ponticum. Fls.

bright crimson in dense heads. B.R. 17:1414.—*R. amœ̀num*, Planch.= Azalea amœna.—*R. Anthopògon*, D. Don. Low shrub: lvs. elliptic-oblong, ferrugineous-lepidote beneath, 1½ in. long: fls. small, funnelform, yellowish white, ½ in. long; stamens 5, included. Himalayas. B.M. 3947. Almost hardy.—*R. arboréscens*, Torr. = Azalea arborescens.—*R. argénteum*, f. Hook. = R. grande.—*R. Aùcklandi*, Hook. f. = R. Griffithianum, var. Aucklandi.—*R. balsaminæflòrum*, Hort. Hybrids of the Javanese group, with double pink, yellow and white fls. G.C. II. 18:230 and III. 12:769. Gt. 37, p. 265. The name has also been used for a double form of Azalea Indica, see A. Indica, var. rosiflora.—*R. barbàtum*, Wall. Tree, attaining 60 ft.: lvs. with setose petioles, elliptic-oblanceolate, glabrous and pale beneath, 5–7 in. long: fls. deep red, campanulate, 1½ in. across, in dense clusters. Himal. F.S. 5:469–472. Var. Smithii, Clarke. Lvs. ferrugineously subtomentose beneath. B.M. 5120.—*R. bicolor*, Don = Azalea nudiflora.—*R. blandfordiæflòrum*, Hook. Slender shrub, 8 ft. high, allied to R. cinnabarinum: lvs. oblong-lanceolate, ferrugineous-lepidote beneath, 2–3 in. long: fls. funnelform, with cylindric tube, brick- or orange-red, yellow within, 2½ in. long. Himal. B.M. 4930. F.S. 11:1173. I.H. 3:112. B.H. 7, p. 47. G.C. 1856:548 and 1871:236. Gn. 15:169 (as R. cinnabarinum).—*R. Boòthii*, Nutt. Shrub, 6 ft. high, often epiphytal: lvs. ovate-oblong, or oblong-lanceolate, hirsute above when young, minutely lepidote beneath, 4–5 in. long: fls. in dense clusters, campanulate, yellow, 1¼ in. across. Himal. B.M. 7149. I.H. 5:174.—*R. Brookeànum*. Low shrub, often epiphytal, with glabrous purple branches; lvs. oblong-lanceolate, pale beneath, 6–9 in. long: fls. funnelform-campanulate, orange- or golden yellow, 2½ in. across. Borneo. B.M. 4935. F.S. 5, p. 477 and 12:1238–39. G.C. III. 9:621.—*R. calendulàceum*, Torr. = Azalea calendulacea.—*R. calophýllum*, Nutt. Shrub, 3 ft. high: lvs. oblong-ovate or elliptic, glossy above, lepidote beneath, 3–5 in. long: fls. 4–5, tubular-campanulate, white, slightly tinged yellowish green, 3 in. across. Himal. B.M. 5002. F.S. 22:2340.—*R. camelliæflòrum*, Hook. f. Shrub, 6 ft. high, often epiphytal: lvs. elliptic-lanceolate, ferrugineous-lepidote beneath, 2–3 in. long: fls. 1–2, short-pedicelled, broadly campanulate, white or slightly tinged rose, 1½ in. across; stamens 16. Himal. B.M. 4932.—*R. campylocárpum*, Hook. f. Shrub, 6 ft. high: lvs. elliptic, obtuse, mucronulate, glabrous and glaucous beneath, 2–3½ in. long: fls. several, campanulate, yellow, fragrant, to 2½ in. across. Himal. B.M. 4968. Gn. 54:1186. G.C. II. 21:833; III. 11:501 and 12:609.—*R. Canadénse*, Dipp.=Azalea Canadensis, described on p. 122, Vol. I.—*R. Cavròni*, André. Hybrid of R. formosum and Veitchi. Fls. white, usually slightly tinged rose, fragrant, 3½ in. across. R.H. 1885:60.—*R. Chámpionæ*, Hook.=Azalea Championæ, O. Ktze. It seems not yet introduced. B.M. 4609.—*R. chrysánthum*, Pall. Low shrub, 2 ft. high: lvs. elliptic-oblong, acute, 1–2 in. long, ferrugineous beneath: fls. few, slender-pediceled, broadly campanulate, yellow, 1½ in. across. Siberia, Kamschatka. Hardy.—*R. ciliàtum*, Hook, f. Small shrub, 2–4 ft.: lvs. elliptic, acuminate, pilose above, ciliate, pale and lepidote beneath, 2 in. long: fls. several, campanulate, pale purple, 1½ in. across. Himal. P.F.G. 3:83. Var. roseo album, Hook. Fls. larger, white, tinged rose. B.M. 4648. F.S. 8:766. Gt. 16:563.—*R. ciliicàlyx*, Franch. Small shrub: lvs. elliptic-obovate, shortly acuminate, ciliate, pale and lepidote beneath: fls. 7–10, campanulate, white, 2 in. across. Yunnan. R.H. 1899:36.—*R. cinnabarinum*, Hook, f. Slender-branched shrub: lvs. elliptic to elliptic-lanceolate, lepidote beneath, 2–3 in. long: fls. many, nodding, tubular-campanulate, rose-orange or brick-red, 1¼ in. long. Himal. Var. pallidum, Hook. Lvs. glaucous beneath: fls. pale rose, spotted red within. B.M. 4788. Var. Roylei, Hook. Lvs. ferrugineous beneath: fls. larger, of brighter color. Gn, 44:940. G.C. II. 21:765 and III. 1:2709.—*R. cliviànum*, Hook. Hybrid of R. arboreum album and Catawbiense. Fls. white, blushed and spotted carmine. B.M. 4478.—*R. citrìnum*, Hassk. Small shrub: lvs. elliptic-oblong, obtuse, lepidote and pale beneath, 1½–2 in. long: fls. several, nodding, campanulate, pale yellow, ¾ in. long, fragrant. Java. B.M. 4797. Tender.—*R. Collettiànum*, Aitch & Hemsl. Shrub, 10 ft. high: lvs. elliptic-lanceolate, brownish lepidote beneath, 1½–3 in. long: fls. short-pedicelled, funnelform, white, 1 in. long. Afghan. B.M. 7019. G.C. III. 4:297.—*R. Cúnninghami*, Hort. Hybrid of R. arboreum, var. cinnamomeum and R. maximum, var. album. Fls. white, spotted purple. Moore, Gard. Mag. Bot. 1851:121. Not to be confounded with R. Cunningham's White, a variety or hybrid of R. Caucasicum, which is a dwarf and hardy shrub, much used in Germany as a stock for grafting hardy varieties. *R. Dàlhousiæ*, Hook. f. Straggling shrub, attaining 8 ft., often epiphytal: lvs. elliptic, rusty-lepidote beneath, 4–5 in. long: fls. 3–5, campanulate, yellow, changing to white, fragrant, 4½ in. across. Himal. B.M. 4718. Gn. 28:511. F.S. 5:466–68. Gn. 48, p. 108. Remarkable for the large, lily-like fragrant fls. A double-fld. variety is figured in Gn. 13, p. 517. R. Dalhousiæ hybridum (B.M. 5322) is a hybrid with R. formosum and R. Dalhousiæ Victorianum (F.S. 23:2466), a hybrid with R. Nuttallii.—*R. Dàviesi*, Hort. Hybrid of R. Javanicum and retusum, with tubular orange-red fls. F.M. 20:474. Not to be confounded with Azalea Daviesi, see Vol. I, p. 120.—*R. décorum*, Franch. Shrub: lvs. oblong-ovate, glabrous, glaucous beneath: fls. broadly campanulate, white or pink, to 2 in. across; stamens 16. Thibet, Yunnan.—*R. Delavàyi*, Franch. Tree: lvs. oblong-lanceolate, rufous-tomentulose beneath: fls. in large, dense heads, deep red, broadly campanulate, 1 in. across. Yunnan.—*R. Edgeworthii*, Hook. f. Straggling shrub, often epiphytal: lvs. ovate-lanceolate, blackish green and reticulate above, ferrugineous-tomentose below, 3–4 in. long: fls. few, broadly campanulate, white, tinged rose, with broad, waved lobes, 4½ in. across. Himal. B.M. 4936. F.S. 8:797–98.—*R. exímium*, Nutt. = R. Falconeri, var. eximium.—*R. Fálconeri*, Hook. f. Shrub or tree, attaining 30 ft.: lvs. elliptic or obovate, rusty-tomentose beneath, 8–10 in. long: fls. many, campanulate, 8–10-lobed, white, with a dark purple blotch within, 1–2 in. across. Himal. B.M. 4924. F.S. 5:477–80; 11:1166–67. Gt. 19:658. Gn. 48, p. 103; 49, p. 441. G.C. III. 20:749. Remarkable for its very large lvs., sometimes to 1½ ft. long. Var. eximium, Hook. Fls. rose-colored and not spotted.—*R. fastuòsum*, var. flore pleno, Vanhoutte. Hybrid of R. Catawbiense and R. Ponticum. Fls. lilac-purple, semi-double. F.S. 2:143. Almost hardy.—*R. Fárreræ*, Tate = Azalea Farreræ.—*R. flàvum*, Don = A. Pontica.—*R. Fórdii*, Hemsl. Shrub: lvs. lanceolate, glabrous, 2–3 in. long: fls. few, pure white, 1½ in. across. S. China.—*R. formòsum*, Wall. (R. Gibsoni, Paxt.). Slender shrub, 8 ft. high: lvs. oblong-obovate, ciliate, pilose above, glaucous and lepidote beneath, 1–2½ in. long: fls. few, funnelform-campanulate, white, tinged pink, 1½–2 in. across. Himalaya Mts. B.M. 4457. P.M. 8:217. G.C. III. 17:711.—*R. Forsteriànum*, Hort. Hybrid of R. Edgeworthii and Veitchii. Fls. large, white.—*R. Fórtunei*, Lindl. Shrub, 12 ft. high, with stout branches, glabrous: lvs. oblong, acute, glaucous beneath, 5–7 in. long: fls. many, broadly campanulate, 7-lobed, rosy lilac; stamens 14. B.M. 5596. Almost hardy.—*R. fúlgens*, Hook. f. Allied to R. campanulatum, but smaller: fls. deep blood-red, in a dense head. Himal. B.M. 5317. F.S. 8:789.—*R. Gíbsoni*, Paxt. = R. formosum.—*R. glaùcum*, Hook. f. Small shrub, 3 ft. high: lvs. elliptic-oblong, lepidote, glaucous beneath, 2–4 in. long: fls. 5–8, campanulate, rose-colored, 1½ in. across. Himal. B.M. 4721. F.S. 7:672.—*R. gránde*, Wight (R. argenteum, Hook. f.). Tree, to 40 ft.: lvs. oblong-obovate, acute, glabrous, white beneath, 8–12 in. long: fls. in a dense head, campanulate, 5–8-lobed, rosy at first, changing to white, 2–3 in. across. Himal. B.M. 5054. Gn. 48:1026. F.S. 5:473–76. G.C. II. 17: suppl. June 10; III. 4:158 (suppl.); 27:105. R.H. 1888, p. 197. Var. roseum, Hook. Fls. rose-colored. B.M. 6948.—*R. Griffithiànum*, Wight. Shrub, 8 ft. high, glabrous: lvs. oblong, pale beneath, 6–12 in. long: fls. 4–6, broadly campanulate, white, fragrant, 3 in. across or more. Himal. Gt. 15:517. Var. Aucklandi, Hook. Fls. 7 in. across. B.M. 5065. Gn. 20:303. R.H. 1855:81. G.C. II. 22:657; III. 12:607. Remarkable for its very large fls.—*R. Halopeànum*, André. Hybrid of R. arboreum and Griffithianum. Fls. large, blush. R.H. 1896:428.—*R. Hárrisii*, Hort. Hybrid of R. arboreum and Thompsoni. Fls. deep crimson, spotted within.—*R. Hódgsoni*, Hook. f. Shrub or small tree, attaining 20 ft.: lvs. narrowly obovate-oblong, whitish or brownish tomentose beneath, 8–18 in. long: fls. in a dense head, broadly campanulate, pale purple, 2 in. across. Himal. B M. 5552. R.H. 1855:421; 1866:191.—*R. Hoòkeri*, Nutt. Shrub, 14 ft. high: lvs. oblong-oval, glabrous, glaucous below and sparingly chaffy on the veins: fls. campanulate, deep crimson, 1–1¾ in. across; calyx cup-shaped. Himal. B.M. 4926.—*R. Indicum*, Sweet = Azalea Indica.—*R. irroràtum*, Franch. Shrub, several feet high, glabrous: lvs. oblong to oblong-lanceolate, pale beneath, 3–4 in. long: fls. many, funnelform-campanulate, 1½ in. long, white, tinged pink. Yunnan. B.M. 7361.—*R. Javánicum*, Blume. Large shrub, glabrous: lvs. elliptic to oblong, acute, minutely lepidote beneath, 3–6 in. long: fls. many, funnelform, orange-yellow to brick-red, 2 in. across. Winter. Malayan Archipel. and Penins. B.M. 4336. F.S. 3:293–94; 6:576. P.M. 15:217. Var. tubiflorum, Hook. Lvs. smaller: fls. smaller and with longer tube, salmon-pink. B.M. 6850.—*R. Jénkinsi*, Nutt.=R. Maddeni.—*R. Kamschàticum*, Pall. = Azalea Kamschatica.—*R. Kéndrickii*, Nutt. Large

2111. Rhododendron maximum (× ¼).

shrub: lvs. lanceolate, acuminate, glabrous, pale beneath, 4–7 in. long: fls. many, campanulate, bright scarlet, 2 in. across. Himal. Var. latifolium, Hook. Lvs. broader, oblong lanceolate, glandular pubescent beneath when young. B.M. 5129.—*R. Kewénse*, W. Wats. Hybrid of R. Griffithianum and Hookeri. Fls. large, in loose heads, crimson, pink or almost white. Gn. 42:885; 52:1139. G.C. III. 23:291.—*R. Kèysii*, Nutt. Shrub, 2–6 ft. high, with ferrugineous branches: lvs. elliptic-lanceolate, glabrous, pale and sparingly scaly beneath, 3–4 in. long: fls. many, tubular, with short erect lobes, brick-red, 1 in. long. July. Himal. B.M. 4875. F.S. 11:1110. Gt. 12:415. Gn. 48, p. 106.—*R. Kótschyi*, Simk. (R. myrtifolium, Schott & Kotschy, not Lodd.). Low shrub: lvs. oblong-obovate, obtuse, mucronulate, shining above, ferrugineous-lepidote beneath, ½–1 in. long: fls. few, tubular-funnelform, with the tube outside pubescent, inside villous, carmine, ¾ in. long: style shorter than ovary. July. Carpathian Mts. Gn. 56, p. 159. Reichenb. Ic. Flor. Germ. 17:1157, figs. 2, 3.—*R. lácteum*, Franch. Tree: lvs. cordate, elliptic-ovate tomentulose beneath: fls. in dense heads, broadly campanulate, 6-lobed, white, 1 in. across. Yunnan.—*R. lanàtum*, Hook. f. Shrub or small tree: lvs. obovate to obovate-oblong, with tawny woolly tomentum beneath, and also above when young, 3–5 in. long: fls. 6–10, broadly campanulate, yellow, spotted red within, 2–2½ in. across. Himal. F.S. 7:684. R.H. 1855:161. Almost hardy.—*R. lancifòlium*, Moench = R. Ponticum.—*R. lancifòlium*, Hook. f. = R. barbatum.—*R. Lappónicum*, Wahl. Depressed shrub; lvs. oval or oblong, obtuse, ¼–½ in. long: fls. 3–6, broadly campanulate, purple, ½ in. across; stamens 5–8. July. Mts. of N. Amer., N. Eu., N. Asia. B.M. 3106. Hardy.—*R. ledifòlium*, Don = Azalea rosmarinifolia.—*R. lepidòtum*, Wall. (R. elæagnoides, Hook. f.). Slender shrub, 4 ft. high: lvs. obovate to lanceolate, glaucous-green, lepidote beneath, ½–1½ in. long: fls. 1–3, sometimes many, slender-pedicelled, broadly campanulate, yellow or dull purple, spotted within, ½ in. across; stamens usually 8. Himal. B.M. 4657. Gn. 15:159. G.C. II. 22:297. Var. chloranthum, Hook. (R. salignum, Hook. f.). Fls. greenish or pale yellow, spotted greenish: lvs. narrow. Var. obovatum, Hook. Fls. dark purple, larger: lvs. obovate.—*R. leucánthum*, Bunge = R. rosmarinifolia, var. alba.—*R. linearifòlium*, Sieb. & Zucc. = Azalea linearifolia.—*R. Lóbbi*, Veitch. Slender shrub, allied to R. Malayanum: lvs. elliptic-oblong: fls. almost salver-shaped, with slender, curved tube, bright crimson. Winter. Borneo. The R. Lobbianum, T. Moore (F.M. 1:10), belongs to R. Brookeanum.—*R. Lùscombei*, W. Wats. Hybrid of R. Fortunei and Thomsoni. Fls. large, rose-red to crimson.—*R. macránthum*, Don = Azalea Indica, var. macrantha.—*R. macrocàrpos*, Griff. = R. Dalhousiæ.—*R. macrosèpalum*, Maxim. = Azalea macrosepala.—*R. Máddeni*, Hook. f. Shrub, to 8 ft.: lvs. elliptic-lanceolate, ferrugineous-lepidote beneath, 4–7 in. long: fls. 3, funnel-shaped, white, faintly blushed, to 4 in. across: stamens 18–20. Himal. B.M. 4805. F.S. 9:912. R.H. 1855:301. I.H. 4:140. Gt. 9:277 (as R. Jenkinsi).—*R. Malayànum*, Jack. Small shrub or small tree: lvs. elliptic-lanceolate, red-brown-lepidote beneath, 3–4 in. long: fls. few, salver-shaped, dull scarlet, ¾ in. long. Winter. Malacca, Java. B.M. 6045.—*R. Mánglesi*, Hort. Hybrid of R. Griffithianum and R. hybridum album elegans. Fls. large, white, spotted. G.C. II. 24:49; III. 12:767.—*R. modéstum*, Hook. f. Small shrub, glabrous: lvs. elliptic-oblong, greenish yellow and lepidote beneath, 2–3 in. long: fls. 6–10, broadly funnelform, pale pink, spotted red within, 1½ in. across. Himal. B.M. 7686.—*R. mólle*, Sieb. & Zucc = Azalea Sinensis.—*R. Moulmainénse*, Hook. Shrub: lvs. elliptic-lanceolate, glabrous, 4–5 in. long: fls. many, white, funnelform-campanulate, 1½–2 in. across. Himal. B.M. 4904.—*R. multicolor*, Miq. Small, slender shrub: lvs. whorled, narrowly elliptic-lanceolate, 2–3 in. long; fls. few, funnelform campanulate, 1 in. long, yellow or dark red. Winter. Sumatra. B.M. 6769. Tender. The red-fld. form is distinguished as var. Curtisi, Hort. Gn. 56, p. 62.—*R. myrtifòlium*, Schott & Kotschy, not Lodd. = R. Kotschyi.—*R. niveum*, Hook. f. Small shrub, allied to R. campanulatum: lvs. obovate-oblong, whitish tomentose all over at first, later glabrous above, 3–6 in. long: fls. broadly campanulate, light rose-lilac at the base, within with 5 purple spots, 2 in. across. Himal. B.M. 4730. Var. fulva, Hook. Lvs. light brownish tomentose; fls. deep purple-lilac. B.M. 6827.—*R. Nobleànum*, Lindl. Hybrid of R. arboreum and Caucasicum. Fls. rosy crimson. B.R. 21:1820.—*R. nudiflòrum*, Torr. = Azalea nudiflora.—*R. Núttalli*, Booth. Shrub, sometimes epiphytal, or tree 30 ft. high: lvs. elliptic-oblong, reticulate, pale and lepidote beneath, 6–12 in. long: fls. 4–12, broad funnelform, white, tinged yellow within, fragrant, to 6 in. across; calyx large. Himal. B.M. 5146. F.S. 13:1326–27. Gn. 54, p. 106. G.C. II. 20:49; III. 12:436 (suppl.).—*R. occidentàle*, Gray = Azalea occidentalis.—*R. obovàtum*, Hook. f. = R. lepidotum, var. obovatum.—*R. obtùsum*, Planch. = Azalea Indica, var. obtusa.—*R. ovàtum*, Planch. = Azalea ovata.—*R. parvifòlium*, Adams. Shrub, 3 ft. high, allied to R. Lapponicum, but larger: lvs. not revolute at the margin, larger: fls. larger, purple or white; style much longer than stamens. Sibir., Kamsch., Japan. Gt. 26:904.—*R. péndulum*, Hook. f. Slender shrub, 4 ft. high: lvs. elliptic to oblong, acute, ferrugineous-tomentose beneath, 1½–2 in. long: fls. few, broadly campanulate, white, about 1 in. across. Himal. F.S. 7:662. G.C. II. 17:429.—*R. Przewálskii*, Maxim. Allied to R. brachycarpum, but lvs. glabrous and pale green beneath: fls. white, spotted purple within. China. Hardy.—*R. pulchérrimum*, Lindl. Hybrid of R. arboreum and Caucasicum. Fls. pink, paler in center, spotted. B.R. 21:1820.—*R. racemòsum*, Franch. Small upright shrub: lvs. elliptic, glaucous and lepidote beneath, ¾–1½ in. long: fls. from axillary buds, crowded toward the end of branches, campanulate, light pink, ¾–1 in. across, slightly fragrant. Yunnan. B.M. 7301. Gn. 42:878. G.C. III. 12:63.—*R. retùsum*, Bennett. Shrub, 2 ft. high: lvs. obovate to obovate-oblong, glabrous, lepidote beneath, 2–2½ in. long: fls. 6–9, tubular-funnel-shaped, bright scarlet, to 1½ in. long. Java. B.M. 4859. F.S. 10:1044. I.H. 2:70. Tender.—*R. Rhòdora*, Don = Azalea Canadensis.—*R. rhómbicum*, Miq. = Azalea rhombica.—*R. Ròllissoni*, Paxt. Small tree, 30 ft. high, allied to R. arboreum and probably variety: lvs. oblong, wrinkled above, tawny-tomentose beneath: fls. in a dense head, campanulate, deep blood-red. Ceylon. P.F.G. 1:7. B.R. 29:25.—*R. Rovéllii*, Leroy. Hybrid of R. arboreum and Dahuricum. Fls. rich crimson. R.H. 1868:190.—*R. Róylei*, Hook. = R. cinnabarinum, var. Roylei.—*R. Russelliànum*, Sweet. Hybrid of R. arboreum and Catawbiense. Fls. rosy crimson. S.B.F.G. II. 1:91.—*R. rubiginòsum*, Franch. Rigid shrub, 3 ft. high: lvs. oval to oblong-lanceolate, densely ferrugineous lepidote beneath, 2–3 in. long: fls. few, broadly funnelform, bright rose-red, 1½ in. across. Yunnan. B.M. 7621.—*R. salignum*, Hook. = R. lepidotum, var. chloranthum.—*R. scabrifòlium*, Franch. Small rigid shrub, hispid: lvs. oblong-lanceolate, ciliate, hispid above, pale and lepidote beneath, 2½–3½ in. long; several few-fld. clusters at the end of branches: fls. broadly campanulate, blush, 1½ in. across. Yunnan. B.M. 7159.—*R. Schlippenbachi*, Maxim. = Azalea Schlippenbachi.—*R. semibarbàtum*, Maxim. = Azalea semibarbata.—*R. serpyllifòlium*, Miq. = Azalea serpyllifolium.—*R. Sesteriànum*, Hort. Hybrid of R. Edgeworthi and formosum. Fls. large, white.—*R. Shèpherdii*, Nutt. Shrub: lvs. oblong-lanceolate, glabrous, pale beneath, 3–4 in. long: fls. in a dense head, campanulate, deep scarlet, 2 in. across. Himal. B.M. 5125.—*R. Shilsoni*, Hort. Hybrid of R. barbatum and Thomsoni. Fls. dull red. Gn. 57, p. 261.—*R. Sinénse*, Sweet = Azalea Sinensis.—*R. Smirnowi*, Trautv. Shrub or small tree, 20 ft. high: lvs. elliptic-oblong, grayish white-tomentose beneath, 3–5 in. long: fls. in a compact head, broadly funnelform, rosy-lilac, spotted within, 3 in. across. Caucasus. Gt. 35:1226. B.M. 7495. R.H. 1899:500. G.C. III. 20:15. Hardy.—*R. Smíthii*, Sweet. Hybrid of R. arboreum and Ponticum. Fls. rosy purple. S.B.F.G. II. 1:50.—*R. Smíthii*, Nutt. = R. barbatum. var. Smithi.—*R. Téysmannii*, Miq. Closely allied to R. Javanicum: lvs. more shining, not lepidote beneath: fls. somewhat smaller, pale lemon-yellow. Sumatra, Java.—*R. Thómsoni*, Hook. f. Shrub, 15 ft. high; lvs. obovate-oval, glabrous, glaucescent beneath, 2–3 in. long: fls. 6–8, campanulate, deep blood-red, 2 in. across; calyx large. Himal. B.M. 4997. R.H. 1855:121. F.S. 7:688–690.—*R. triflòrum*, Hook. f. Shrub, 6 ft. high: lvs. ovate-lanceolate, glaucous beneath and with ferrugineous scales, 2–3 in. long: fls. mostly 3, slender-pedicelled, broadly campanulate, greenish yellow, 2 in. across. Himal. F.S. 7:673. G C. II. 18:45. J.H. III. 30:193.—*R. Tschonóskii*, Maxim. = Azalea Tschonoskii.—*R. tubiflòrum*, DC. = R. Malayanum.—*R. Ungerni*, Trautv. Closely allied to Smirnowi, but fls. white: calyx with longer, narrower lobes. July. Caucasus. Gt. 35:1226.—*R. Vàseyi*, Gray = Azalea Vaseyi.—*R. Veitchiànum*, Hook. Shrub, 6 ft. high: lvs. obovate, glaucous beneath and with scattered ferrugineous scales, 3–4 in. long: fls. 3–5, broadly funnelform, with crisped lobes, pure white, 5 in. across. Himal. B.M. 4992. F.S. 14:1416. A.F. 11:145. Gn. 51, p. 178—*R. venùstum*, Sweet. Hybrid of R. arboreum and Caucasicum. Fls. rich pink. S.B.F.G. II. 3:285.—*R. virgàtum*, Hook. f. Slender shrub: lvs. oblong-lanceolate, glaucous and scaly beneath: fls. 1–2, from axillary buds at the end of branches, funnelform, rose-colored, 1¼ in. across. Himal. B.M. 5060. F.S. 14:1408. Var. album, Hort. Fls. white. R.H. 1866:251.—*R. viscòsum*, Torr. = Azalea viscosa.—*R. Wighti*, Hook. f. Shrub, attaining 14 ft.: lvs. obovate-oblong, cinnamomeous-tomentose beneath, 6–8 in. long: fls. many, campanulate, yellow, spotted red within, 2½ in. across. Himal. F.S. 8:792–93.—*R. Yunnanénse*, Franch. Upright shrub: lvs. elliptic-lanceolate, ciliate, pilose above, pale and sparingly lepidote beneath, 2–3 in. long: fls. few, funnelform, white, spotted blood-red, 2 in. across. Yunnan. B.M. 7614.

ALFRED REHDER.

RHODOLEÌA (Greek, *rose* and *smooth;* alluding to rose-like fls. and smooth stem). *Hamamelidàceæ*. A genus of 2 species of small tender trees, one from China and the other from Java and Sumatra. Lvs. evergreen, glabrous, long-stalked: fls. about 5 together in a compact head, having the appearance of a single flower surrounded by bracts, hermaphrodite; petals of each flower turned toward the circumference of the head; stamens 7–10: ovary of 2 carpels united at base; capsule several-seeded.

Chámpioni, Hook. A tender tree: lvs. shining, coriaceous, usually ovate, 4–5 in. long; petioles 1½–2 in. long: fl.-heads resembling a semi-double Camellia, 1½ in. across, bright pink, each head surrounded by several rows of imbricate bracts: petals 15–20 to each fl.-head. China. B.M. 4509.—Cult. in S. Calif.

F. W. BARCLAY.

RHODOMỲRTUS (Greek, *rose-myrtle;* from the rose-colored fls. of some species and the myrtle-like foliage). *Myrtàceæ.* Five species of tender trees or shrubs, one of which is a promising fruit-plant known in the South as Downy Myrtle, and in India as the Hill Gooseberry. This is a handsome evergreen shrub growing 6 ft. or more high and covered with broad, glossy lvs. of great beauty. The pink, 5-petaled fls. are borne through several weeks in greatest abundance, and are larger than those of the peach. They resemble small single roses. The fruits are as big as cherries and taste like raspberries. The color of the berries is dark purple and the flesh is sweet and aromatic. The fruits are produced in quantity and ripen for weeks, beginning in late summer. They are eaten raw or made into jam. The Downy Myrtle is recommended as a fruit-plant for Florida by the American Pomological Society and it is being tried in S. Calif. In the South it is generally known as *Myrtus tomentosa.* The distinction between Rhodomyrtus and Myrtus rests in the number of locules of the ovary. Myrtus is normally 2–3-loculed, with many ovules in each; Rhodomyrtus has 1–3 locules with spurious partitions, making the ovary appear 2–6-loculed, or it is divided into numerous 1-ovuled, superposed locules. Myrtles have feather-veined foliage; the Downy Myrtle has 3-nerved lvs. The Downy Myrtle is a native of India, Malaya and China; the four other species of Rhodomyrtus are Australian and not in cult. Other generic characters: Lvs. opposite, 5- or 3-nerved: fls. axillary; calyx-lobes persistent; petals 5, rarely 4; stamens numerous, free; berry globose or ovoid, with few or many seeds.

2112. Rhododendron arboreum (× ⅛). No. 6. (See page 1522.)

tomentòsa, Wight (*Mýrtus tomentòsa,* Ait.). DOWNY MYRTLE. Branches downy above: lvs. elliptic or obovate, short-stalked, hoary below: peduncles shorter than the lvs., 1–3-fld.: berry 3-celled: seeds compressed, forming 2 rows in each cell. B.M. 250.

E. N. REASONER and W. M.

RHODÒRA. See *Azalea Canadensis.*

RHODORHÌZA (Greek, *rose root:* the root and wood furnish the fragrant powder known as *bois de rose*). *Convolvulàceæ. R. florida* is a tender subshrub, 6–9 ft. high, which bears white fls. something like a morning-glory. The blossoms are about an inch across and last only a day, but a succession is maintained (in southern France) from early June till August. A striking feature of the plant is its terminal, panicled inflorescence. These panicles are often a foot high, 10 inches wide at the base and contain at one time as many as 20 full-blown flowers and 100 buds. It is a native of Teneriffe, and has been introduced into southern California in 1901.

Rhodorhiza is a group of about 7 species, all from the Canary Islands, which Bentham and Hooker regard as a section of the genus Convolvulus. The Rhodorhizas differ from typical Convolvulus in having the capsule by abortion usually 1-seeded, and rupturing irregularly at the base instead of dehiscing by 4 valves. They are prostrate or climbing herbs or erect subshrubs, sometimes spinescent: lvs. entire, dentate, undulate or lobed: corolla broadly or narrowly bell-shaped; limb 5-angled or 5-lobed: ovary 2-loculed, 4-ovuled.

flórida, Webb. (perhaps more properly *Convólvulus flóridus,* Linn.). Erect subshrub: lvs. persistent, alternate, lanceolate, stalked, entire: fls. long-peduncled, funnel-shaped, white, sometimes pinkish white. R.H. 1892:156.

W. M.

RHODOTHÁMNUS (Greek, *rhodon,* rose, and *thamnos,* shrub; small shrub, with rose-colored flowers). *Ericàceæ.* Dwarf evergreen shrub, with alternate, small, entire lvs. and rather large pink fls., usually solitary at the ends of the branchlets. Charming little alpine shrub, hardy north, but somewhat difficult to cultivate. It thrives best in peaty, porous soil of constant, moderate moisture in a partly shaded situation, and is best suited for rockeries. Prop. by seeds or layers, also by cuttings of ripened wood under glass. Monotypic genus, allied to Kalmia, but anthers not in pouches: lvs. alternate: sepals 5, half as long as corolla: corolla rotate, deeply 5-lobed; stamens 10, slightly longer than corolla: fr. a 5-celled, many-seeded dehiscent capsule.

Chamæcistus, Reichb. (*Rhododéndron Chamæcistus,* Linn. *Adodéndron Chamæcistus,* O. Kuntze). Diffusely branched shrub, to 1 ft.: lvs. cuneate-oblong, acute, setosely ciliate, ¼–½ in long: fls. on slender, glandular-hirsute pedicels, solitary, rarely 2 or 3 at the end of the branchlets, light purplish pink, to 1 in. across. May. Alps of Eastern Eu. B.M. 488. L.B.C. 15:1491. F.S. 19:1962

ALFRED REHDER.

RHODOTỲPOS (Greek, *rhodon,* rose, and, *typos,* type; alluding to the resemblance of the flowers to those of a single rose.). *Rosàceæ.* Ornamental deciduous shrub, with opposite serrate lvs. and large white fls. solitary at the end of branchlets, followed by black and shining berry-like drupes persistent during the winter. A handsome and distinct shrub, hardy as far north as Mass., with bright green foliage, conspicuous by its white fls. in spring and by its shining black fr. in autumn and winter. It thrives well in any good soil. Prop. by seeds and by greenwood cuttings under glass early in summer, also by hardwood cuttings. Monotypic genus, allied to Kerria: lvs. stipulate, opposite: fls. solitary, short-pedicelled; sepals large, half as long as petals, outside with 4 small alternate bracts; petals 4, orbicular; stamens numerous; carpels usually 4, developing into black, dry, one-seeded drupes, surrounded by the large persistent calyx.

kerrioides, Sieb. & Zucc. Much-branched shrub, usually 3–6 ft. high (in Japan 15 ft.): lvs. ovate to ovate-oblong, acuminate, sharply and doubly serrate, silky-pubescent beneath when young, 1⅓–3 in. long: fls. pure white, 1½ in. across. May, June. S.Z. 1:99. B.M. 5805. Gt. 15:505. R.H. 1866, p. 430. Gn. 6, p. 229; 34, p. 159; 43, p. 138.

ALFRED REHDER.

RHŒ̀O (name unexplained). *Commelinàceæ.* One species, from Mexico and the West Indies, **R. discolor,** Hance, known also as *Tradescantia discolor,* L'Her., *T. spathacea,* Swartz, and *Ephemerum bicolor,* Moench. B.M. 1192. From Tradescantia the genus is distinguished by having 1 ovule (rather than 2) in each locule

of the ovary. *R. discolor* is a short-stemmed erect-growing long-leaved plant, not unlike a broad-leaved small Pandanus in habit. Fls. white, small and many in a boat-shaped spathe-like structure arising from the axil of the leaf and which is sessile or nearly so; sepals 3, free, more or less petal-like; petals 3, soon withering; stamens 6. Var. **vittàta**, Hook. (*Tradescántia díscolor*, var. *vittata*, Miq. *T. díscolor*, var. *variegàta*, Hook. *T. variegàta*, Hort.), is the common form in cult. The lvs. are 8–12 in. long, dark purple beneath and longitudinally striped above with pale yellow. A striking plant for the warmhouse, or for the open in the South. B.M. 5079. F.S. 11:1169–70. Cult. as for warmhouse Tradescantias.
L. H. B.

RHOPÀLA. See *Roupala.*

RHOPALÓSTYLIS (name refers to the club-shaped spadix). *Palmàceæ.* Two species of pinnate palms, both of which are favorite conservatory palms and nearly always sold as species of Areca or Kentia. However, Rhopalostylis belongs to the large group in which the ovule is borne on the side and is more or less pendulous, while in Areca and Kentia the ovule is at the base and erect. From the 5 cultivated genera listed under *Hedyscepe* (which see) Rhopalostylis differs as follows: sepals of staminate fls. awl-shaped to lanceolate, not imbricated: stamens 6–12: pistillate fls. with short petals, valvate at the apex. The two species are spineless palms with medium ringed caudices: lvs. terminal, equally pinnatisect; segments equidistant, numerous, narrowly sword-shaped, acuminate, the margins not thickened, recurved at the base, the midveins prominent, with 1–3 nerves on each side; rachis concave above, scurfy; petiole very short; sheath elongated: spadices short, spreading, with a very short, thick peduncle, and fringed, rather thick, densely-fld. branches: spathes 2, symmetrical, oblong, flattened, the lower 2-winged: bracts adnate to the flower-bearing areas, subulate at the apex: bractlets scaly: fls. medium: fr. small or medium, ellipsoidal, smooth.

sápida, H. Wendl. & Drude (*Arèca sápida*, Soland. *Kéntia sápida*, Mast.). Stem 6–10 ft. high, 6–8 in. in diam., cylindrical, green: lvs. 4–6 ft. long, pinnate: segments very narrow, linear; margin replicate; nerves, midrib and petiole covered with minute scales: fls. pale pinkish: fr. brown. New Zealand. B.M. 5139.

Baùeri, H. Wendl. & Drude (*Arèca Baùeri*, Hook. *Kéntia Baùeri*, Seem. *Seafórthia robústa*, Hort.). Stouter and taller than *R. sapida:* lvs. larger and broader; segments linear-lanceolate, acuminate; nerves, midrib and petiole sparsely scaly: fls. white: fr. more globose, scarlet. Norfolk Isl. I.H. 15:575. B.M. 5735
Jared G. Smith.

RHUBARB, or Pie-plant (see *Rheum*), is commonly grown by division of the roots, and this is the only method by which a particular type can be increased. Propagation from seed, however, often proves satisfactory, and always interesting, as the seedlings vary greatly. The seed germinates easily, and if started early the plants become fairly large and strong the same season. Although the crop is so easily produced, and so certain and regular after a plantation has once been started, it is one of the most profitable of market-garden crops, even in small places and neighborhoods. A large number of home gardeners are still without it on their premises, although everybody seems to want Rhubarb pie as soon as spring opens, this plant giving the first available material in the year for pies.

Rhubarb delights in extremely rich soil. Very large and brittle leaf-stalks cannot be secured except from soil that is really "filled with manure to overflowing." The seedlings, however, may be started in any good clean garden soil. Sow seed in early spring, in rows a foot apart and not over an inch deep. Thin the plants promptly to stand a few inches apart in the rows, and give the same thorough cultivation allowed to other garden crops. In the following fall or spring take the seedlings up, and set them in the well-prepared permanent patch, not less than four feet apart each way, and cultivate frequently during the entire season. Ten to twenty plants will supply the demands of one household, possibly with some to spare for the neighbors. In spring of the next year the stalks may be pulled freely. When soil fertility forces a rampant growth, the stalks will be large and brittle enough without the aid of boxes or kegs (bottomless and coverless) placed over the plants. The beds should be renewed every 4 or 5 years at the least, as the clumps of roots grow so large, and have so many eyes, that the stalks soon become more numerous than desirable, and run down in size. Take up the entire roots and cut them to pieces, leaving only one strong eye to the piece, and plant the pieces in a newly-prepared bed (or even in the old one if properly enriched and prepared) four feet apart each way as before. Seed-stalks are produced freely during the entire season. These should be promptly pulled up, unless seed is wanted. A few may be left to mature the seed crop.

Rhubarb can be forced in coldframes, under the greenhouse benches, or even in an ordinary house cellar. The plants need warmth (even that of a lantern set among them will do), but require no light. Take up good strong roots (2-year seedlings being best) in autumn; leave them out until after exposure to freezing, then crowd them together in boxes with a little soil between and under them, and set them under the greenhouse bench, or wherever wanted, or plant them out on the cellar bottom.
T. Greiner.

Rhubarb is a hardy plant and will withstand considerable neglect, but, like most cultivated vegetables, it responds readily to proper care and good treatment. The large fleshy stems desired in culinary use are produced in part by the great store of plant-food held in reserve by the many big roots of the vegetable. Everything should be done to increase this supply of reserve food. Tillage and fertilizing, therefore, are fundamentals. In the selection of a site the writer prefers a southern exposure, with sufficient slope to the south to give good drainage. Plow the ground 6–8 in. deep, draw furrows 5 ft. apart, set the plants 3 ft. apart, with the buds one inch below the level of the ground. If the soil lacks in fertility mix compost with the dirt that is placed about the roots; never put fresh manure next to the roots. As soon after planting as possible start the cultivator, and give a thorough stirring at intervals of 6–8 days up to the middle or last of August. After the ground is frozen cover the rows 3–4 in. deep with manure that is as free as possible from weed and grass seed. As early in the spring as the ground can be worked to advantage, start the cultivator and work the manure into the soil. Each alternate season the surface of the soil should have a good dressing of manure. The third or fourth year after planting the hills should be divided. Remove the earth from one side of the hill and with a sharp spade cut through the crown, leaving 3–4 buds in the hill undisturbed. This work should be done in the fall or early in the spring.

As a forced vegetable, Rhubarb is growing in popularity. The plant has no choice as to whether it is grown in light or darkness. Blanching improves the flavor and reduces the acid, lessening the quantity of sugar needed in cooking. Divided roots, with 1–3 buds, which have been grown in highly fertilized, well-tilled soil will give the best results. Plow out the plants any time after killing frosts, divide the roots and place them in single layers on top of the ground, covering with earth sufficiently to protect the roots from the air. Leave them in this condition until the roots have been slightly frozen, and then place the roots either in a root cellar, a frame heated by pipes, a hotbed, mushroom house or under benches in a greenhouse. Pack the roots close together, filling in and packing closely with good rich soil. The crowns should be covered 4–6 in. Keep the soil moist and maintain a genial temperature of 55–60°. Avoid over-watering. The roots may be packed in a family cellar without any bad effect to other things, as there is no odor from the plants. Judgment must be exercised in pulling the stems. The work should always be done by an experienced person.

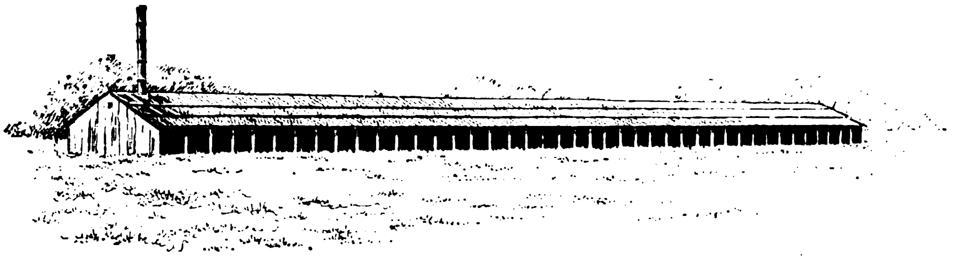
The writer has grown seedlings for ten successive years. Fully 75 per cent of all the seedlings showed a tendency to degenerate, and 25 per cent were almost as coarse as burdocks in appearance. Half of one's seedlings are likely to be of weak vitality. Not more than 15 per cent can be counted on to be fairly true to the varietal type. In the writer's experiments 4 ounces of seed was sown each season. The seed was selected from ideal plants that had been propagated by division.

As to varieties, the writer has had best results with Linnæus and Victoria. S. H. LINTON.

2113. Stalks of forced Rhubarb. The leaf-blades do not develop.

FORCING OF RHUBARB.—The forcing of Rhubarb has now become quite a profitable industry in the vicinity of many of the large cities. It may be forced either in the field where the roots are growing or lifted and placed in hotbeds, under greenhouse benches or in a dark cellar. See Fig. 2113.

Much the larger part of the Rhubarb which is offered for sale during the winter months is grown in rough forcing houses which are built over the plants in the field. Fig. 2114. These houses are simply and cheaply constructed, the sides usually being about five feet high, of rough boards, which are covered with cheap building paper. The roof is formed of hotbed sash. These buildings are usually from 24 to 36 feet in width and of any desired length. Artificial heat is generally provided, steam being the most popular, although the sun is at times depended upon to give the required heat. The soil moisture is usually sufficient, so that no water is given. Plants for forcing should be set not more than two by three feet apart and should be fertilized annually with liberal dressings of compost, that made from cow and hog manure being considered the best. The sash should be placed upon the house during the first part of February, and may be removed for use on hotbeds and coldframes in from four to six weeks. The stalks are usually pulled twice, the returns being from $1.25 to $2 per sash, depending upon the season at which it is placed upon the market. The cost of production is often greatly reduced by growing a crop of spinach or dandelions between the rows, the price obtained for these fillers usually being sufficient to pay for all cost of labor and maintenance.



2114. House for the forcing of Rhubarb, covered with movable sash.

Roots for forcing under greenhouse benches and in hotbeds should be from beds at least three or four years old, as the larger and more vigorous the roots the better the results. Satisfactory results cannot be obtained from inferior roots. The roots should be dug early in the fall before the ground freezes and allowed to remain exposed to the weather until they are frozen solid, when it is best either to remove them to a shed or cover them with litter in the field to prevent alternate freezing and thawing. Care should be taken to leave as much dirt upon the roots as possible when they are dug.

As soon as the roots are placed in position under the benches, all spaces between them should be filled with soil to prevent evaporation. When the plants start into growth they should be given an abundance of moisture. When forced in this manner light is not necessary; therefore any convenient place may be used, provided the proper amount of heat and moisture is supplied. If grown in the dark the development of leaf is much less than in the light, while the color, instead of being green, is usually a dark cherry-red, which gives to the product a very attractive appearance. The temperature may range from 45° to 75°, although the lower the temperature the larger the yield and higher the quality of the product. The time required for bringing a crop to maturity under the benches is about the same as that required for forcing in the field.

The method which is to be followed in the growing of this crop for the winter market will depend largely upon local conditions. When grown by any method which requires the lifting of the roots, it must be remembered that they are worthless after having produced a crop; therefore this method cannot be practiced with economy except where land and labor are cheap, so that the roots may be produced at a slight expense, or where roots may be secured which would otherwise be destroyed. Be the method what it may, the roots to be forced should be well developed and allowed to freeze before forcing is attempted, otherwise failure to secure a profitable crop is certain. G. E. ADAMS.

RHÙS (ancient Greek name). *Anacardiàceæ.* SUMACH. Trees or shrubs with alternate, usually odd-pinnate lvs. and no stipules: fls. in axillary or terminal panicles, small, whitish, greenish or yellow; calyx 5-parted; petals 5 or sometimes 4 or 6; stamens 4–10: fr. a small dry drupe or berry, usually 1-seeded. Plants with resinous or milky juice, wood often yellow: bark and foliage abounding in tannin, and for this reason used in dressing leather.

All the species are beautiful and have been apparently much neglected by planters. Any one who has observed our native Sumachs covering rocky hillsides or barren railway banks with their rich fern-like verdure during summer or when autumn has given them colors of fire, should appreciate their value as subjects for ornamental planting. Some species, too, retain their crimson fruit throughout the year, and help to make bright spots amid the snows of our northern winters. Some of the stronger-growing species answer very well in subtropical planting and may be cut to the ground every year to encourage the strong young shoots that give the most ample foliage. Some are admirable as single specimens, having a picturesque character that is quite refreshing. When grown as standards, however, they are likely to be short-lived, and so the succession must be provided for. The laciniate varieties of two of our native species seem to give more leafage than the types and are very useful in mass-planting. All the species are easily propagated by seed, layers, root-cuttings and some of them by top-cuttings. The tendency that some of them have to spread by suckering is a disadvantage where they are used in fine lawns.

Of over one hundred known species only about sixteen have been in cultivation in this country, and these all species of temperate regions; none of the tropical ones having appeared in the trade, so far as the writer knows.

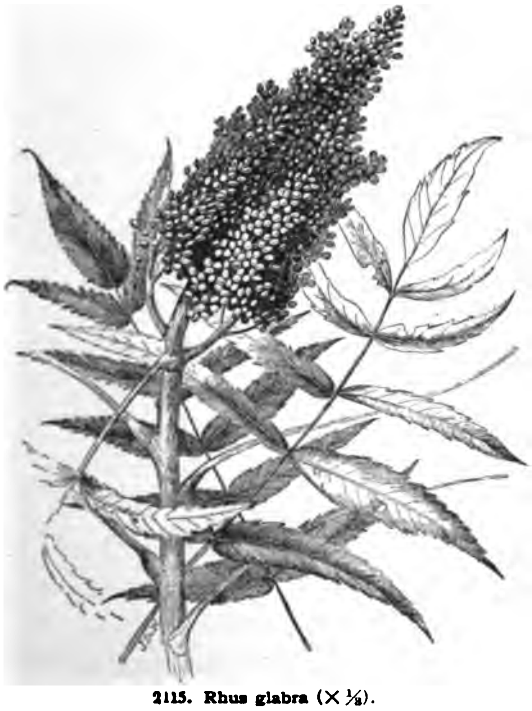
In the following enumeration, two species of Cotinus (Nos. 3 and 4) are included.

INDEX.

aromatica, 5.
atropurpurea, 3.
Canadensis, 5.
copallina, 15.
Coriaria, 14.
cotinoides, 4.
Cotinus, 3.
diversiloba, 7
glabra, 8.
integrifolia, 1.
laciniata, 8, 11.
Osbeckii, 16.
ovata, 2.
pumila, 12.
radicans, 6.
semialata, 16.
succedanea, 10.
Toxicodendron, 6.
trilobata, 5.
typhina, 11.
venenata, 9.
vernicifera, 13.
Vernix, 9.

A. *Foliage simple.*
  B. *Peduncles not plumose in fruit.* 1. **integrifolia**
  2. **ovata**
  BB. *Peduncles plumose in fruit*.... 3. **Cotinus**
  4. **cotinoides**
AA. *Foliage compound.*
  B. *Lfts. normally 3*.............. 5. **Canadensis**
  6. **diversiloba**
  7. **Toxicodendron**
  BB. *Lfts. many,*
    C. *Lvs. smooth on both sides*... 8. **glabra**
    9. **venenata**
    10. **succedanea**
    CC. *Lvs. pubescent beneath* .....11. **typhina**
    12. **pumila**
    13. **vernicifera**
      D. *Rachis margined* ....14. **Coriaria**
      DD. *Rachis winged between lfts*......................15. **copallina**
      16. **semialata**

1. **integrifòlia**, Benth. & Hook. Shrub, 2–8 ft. high: lvs. oval, entire, or occasionally long-petioled, with 3 lfts.: panicles and new growths puberulent: fls. white or rose-colored: fr. very large. California. S.S. 3:109. —An evergreen species.



2115. Rhus glabra (× ⅛).

2. **ovàta**, Watson. Another Californian species resembling the last, but with larger and smoother leaves.

3. **Cótinus**, Linn. Smoke Bush. Venice Sumach. A bush 10–12 ft. high, with simple obovate lvs. and brown bark: fls. purple, in ample loose panicles and on very long pedicels, which become profusely plumose, giving the plant the smoky appearance from which it derives its common name. Early summer. Eu., Asia. Var. **atropurpùrea**, Hort., is distinguished by the darker color of its inflorescence.—This species used to be common in cultivation, but it does not seem to reproduce itself as readily as some species, and in many cases when killed by borers or other causes, it has not been replaced. Gng. 5:118. Gn. 34, p. 162; 54, p. 505.

2116. Young plants of Rhus typhina, var. laciniata.

4. **cotinoides**, Nutt. A small tree, 20–40 ft. high: lvs. undivided, oval or obovate, smooth, thin: fls. greenish yellow, in large panicles: pedicels becoming plumose as they develop. Flowers in spring, and the foliage assumes most brilliant autumn tints. Mississippi valley. S.S. 3:98–9.—Known also as *Cotinus Americanus*, Nutt. Sometimes called "Chittam-wood."

5. **Canadénsis**, Marsh. (*R. aromática*, Ait.). Spreading shrub, 3–8 ft. high, with 3-foliate, crenate, pubescent, petiolate, aromatic lvs.: fls. yellow, small, in clusters or short spikes, either axillary or sometimes terminal: fr. globular, coral-red, sparsely hairy; and comparatively large. Flowers in spring before the lvs. appear. Rocky woods, eastern N. Amer. Var. **trilobàta** has the lfts. deeply cut or 3-lobed.—This is one of our best cover plants or under-shrubs and spreads naturally by layers. Will flourish in any soil and is especially adapted to dry, rocky banks.

6. **Toxicodéndron**, Linn. Poison Oak. Poison Ivy. A scandent or climbing plant: lvs. smooth or often pubescent on veins, ovate, sinuate, or lobed, petiolate: panicles short-stalked: fr. ribbed when dry. June. N Amer. V. 10:103.—Care should be taken in planting this species, as it is very poisonous to many, and for this reason it should be extirpated from our ornamental plantations, rather than added to them. The autumn color is attractive. As here understood, it includes *R. radicans*, Linn.

7. **diversiloba**, Torr. & Gray. A Californian species closely allied to the preceding, equally poisonous, and therefore not to be recommended for planting.

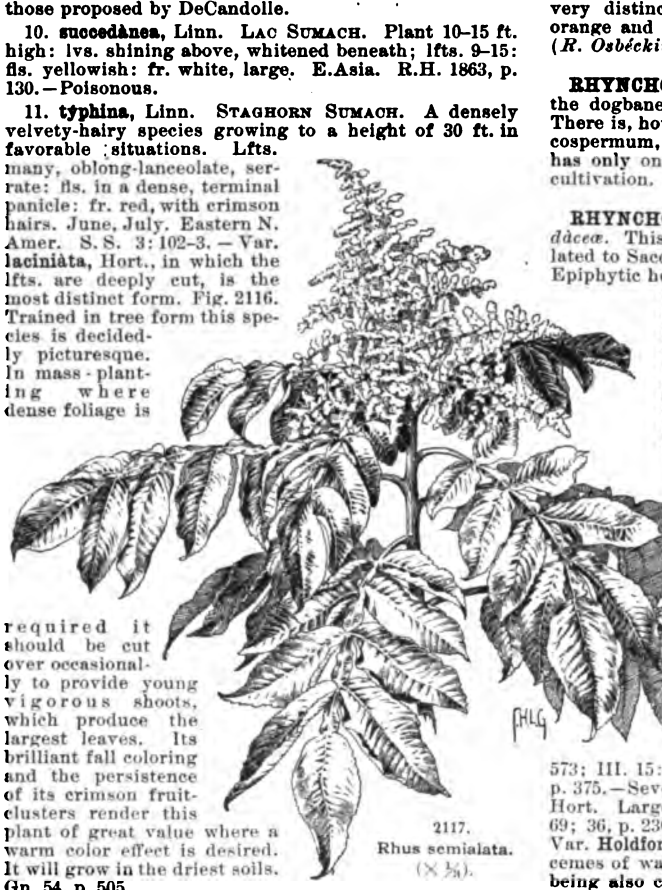
8. **glàbra**, Linn. Smooth Sumach. Fig. 2115. Smooth, glaucous, 10–15 ft. high: lfts. many, green above, white beneath, narrowly oblong, with serrated edges: fls. in terminal panicles: fr. crimson, hairy. July. N. Amer.—One of the best species for mass or other planting. Var. **laciniàta**, Carr., has the lfts. deeply cut, giving the lvs. a very fern-like appearance. Like the type, it colors in autumn. R.H. 1863, p. 7. V. 10:101.

9. **venenàta**, DC. Dogwood. Poison Sumach. Usually taking the form of a tree, 10–20 ft. high: lfts. 7–13 on a red petiole and midrib, smooth, shining green above, pale beneath: fls. in a narrow panicle, drooping: fr. small, flattened, white. June. Moist ground, eastern N. Amer.—One of the most beautiful, but unfortunately

the most poisonous of the Sumachs. The name *R. Vernix*, Linn., is used by some authors for this species and by others for *R. vernicifera;* in order to avoid confusion, it seems best to drop the name and to substitute those proposed by DeCandolle.

10. **succedànea**, Linn. LAC SUMACH. Plant 10–15 ft. high: lvs. shining above, whitened beneath; lfts. 9–15: fls. yellowish: fr. white, large. E.Asia. R.H. 1863, p. 130.—Poisonous.

11. **týphina**, Linn. STAGHORN SUMACH. A densely velvety-hairy species growing to a height of 30 ft. in favorable situations. Lfts. many, oblong-lanceolate, serrate: fls. in a dense, terminal panicle: fr. red, with crimson hairs. June, July. Eastern N. Amer. S.S. 3:102–3.—Var. **laciniàta**, Hort., in which the lfts. are deeply cut, is the most distinct form. Fig. 2116. Trained in tree form this species is decidedly picturesque. In mass-planting where dense foliage is required it should be cut over occasionally to provide young vigorous shoots, which produce the largest leaves. Its brilliant fall coloring and the persistence of its crimson fruit-clusters render this plant of great value where a warm color effect is desired. It will grow in the driest soils. Gn. 54, p. 505.



2117. Rhus semialata. (× ⅓).

12. **pùmila**, Michx. A low, procumbent, villous-pubescent shrub, with 9–13 oblong coarsely serrate lfts.: fls. in nearly sessile thyrsoid panicles: fr. scarlet, globose, tomentose. Mts., N. C. to Ga. G.F. 8:405.—Poisonous.

13. **vernicifera**, DC. VARNISH TREE. LACQUER TREE. Tree-like, 20–30 ft. high: lvs. ample; lfts. 11–15, smooth above, pubescent beneath, midrib more or less broadly margined: young growth also pubescent. This is the plant from which the Japanese obtain the lacquer for the finely polished ware. It is poisonous, and it is said that people have been poisoned by handling the articles coated with the lacquer. Gn. 34, p. 158.—Cult. in S. Calif.

14. **Coriària**, Linn. Height 15–20 ft.: lvs. large, with 11–15 elliptical coarsely toothed lfts.; petiole margined, villous: fls. greenish, in a large, loose, terminal panicle: fr. red. July. S. Eu.—This is the Mediterranean species, much used in that district for preparing the finer grades of leather.

15. **copallina**, Linn. BLACK SUMACH. SHINING SUMACH. A shrub or small tree, sometimes growing to the height of 25 or 30 ft.: lfts. numerous, entire or sometimes indented or cut near the apex, smooth above, usually pubescent beneath; shoots also tomentose; midrib winged between the lfts.: fls. small, greenish, in dense panicles at the end of the branches: fr. slightly flattened, hairy, crimson. July, Aug. Eastern N. Amer. to the Great Plains; succeeds well in dry soils. S.S. 3:107–8.—This beautiful Rhus is the latest of our species to bloom. It makes a fine specimen plant and is also useful in masses.

16. **semialàta**, Murr. Fig. 2117. Plant 15–20 ft. high: lfts. 9–13, smooth above, brown-pubescent beneath; petiole broadly winged between the lfts.: fls. small, in a large, many-branched panicle. July, Aug. Japan.—A very distinct and useful species, assuming brilliant orange and red color in autumn. Var. **Ósbeckii**, Hort. (*R. Osbéckii*, Carr.), is also cult. JOHN F. COWELL.

RHYNCHOSPÉRMUM jasminoides, a fine shrub of the dogbane family, is referred to *Trachelospermum*. There is, however, a good botanical genus named Rhyncospermum, but it belongs to the composite family. It has only one species, *R. verticillatum*, a plant not in cultivation.

RHYNCHÓSTYLIS (Greek, *beaked column*). *Orchidàceæ.* This genus includes a few species closely related to Saccolabium and usually sold under that name. Epiphytic herbs with monopodial stems and 2-ranked, crowded, leathery or fleshy lvs.: fls. in dense racemes from the axils of the lvs., medium-sized; dorsal sepal and petals subsimilar, lateral sepals broader, decurrent on the foot of the column; labellum firmly joined to the base of the column, obovate, inflexed at the apex, not 3-lobed, spurred, the spur straight or curved backwards. For culture, see *Saccolabium*.

retùsa, Blume (*Saccolàbium guttàtum*, Lindl. *S. præmórsum*, Lindl. *S. Rheèdii*, Wight. *S. retùsum*, Voigt. *S. Blùmei*, Lindl.). Stem stout, with channeled lvs. 6–20 in. long: fls. in dense, cylindrical racemes about as long as the lvs., ¾ in. across, white, blotched with pink or violet. June, July. Trop. India and Malay Islands. B.M. 4108. F.S. 7, p. 92; 14: 1463. 1464. B.R. 17:1443 (as *Sarcanthus guttatus*). G.C. 1845:364; II. 1:219 and 23: 573; III. 15:812. Gn. 31, p. 537. A.G. 20:317. S.H. 2, p. 375.—Several varieties are in the trade. Var. **màjus**, Hort. Larger in all its parts. I.H. 15:545. Gn. 31, p. 69; 36, p. 230 (all as *Saccolabium Blumei*, var. *majus*). Var. **Holdfordiàna**, Hort., an old form with large racemes of waxy white fls., spotted with crimson, the lip being also crimson. Var. **gigantèa**, Hort., very much like the type. Var. **Dàyi** and var. **supérba** are offered.

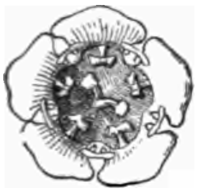
violàcea, Reichb. f. (*Saccolàbium violàceum*, Reichb. f.). Lvs. 10–12 in. long: racemes 1 ft. or more: fls. 1 in. across, white, spotted with pale mauve; labellum dark violet. Jan. Philippines. B.R. 33:30.—The blossoms are said to have a disagreeable odor. Var. **Harrisoniànum**, Hort. (*Saccolàbium Harrisoniànum*, Hook.). Lvs. distichous, oblong, obliquely bifid at the apex: raceme dense, cylindrical, pendulous: fls. white, fragrant; sepals ovate-oblong, somewhat incurved; petals narrower, oblong-spatulate; labellum oblong-obovate, with a thick blunt apiculus, saccate toward the apex; spur blunt; disk with a single thickened line. Malay Islands. B.M. 5433. F.S. 23:2412. The racemes grow to a length of 2 feet. HEINRICH HASSELBRING.

RIBBON GRASS. *Phalaris arundinacea*, var. *variegata.*

RIBBON TREE. *Plagianthus.*

RÌBES (said to have come from the German *riebs*, a vernacular name for currant). *Saxifragàceæ.* CURRANT and GOOSEBERRY. Shrubs, often spiny and prickly, with simple, alternate, palmately veined lvs.: fls. 5-, rarely 4-parted, borne singly or in racemes; calyx-tube coherent with ovary; lobes commonly colored petals; usually small, borne on throat of calyx, alternating with stamens: fr. a berry, tipped with remains of calyx. Fig. 2118. Largely North American, although well represented in Europe, Asia and South America.

Species 60 to 70. For culture, see *Currant* and *Gooseberry*. Cuttings of hard wood in autumn or spring; mound-layers in summer; new varieties by seeds. See Thory, Monographie ou Histoire Naturelle du Genre Grosseillier; Card, "Bush-Fruits" (from which Figs. 2119, 2122, 2124–6 are taken).


2118. Flower of Garden Currant, to show structure (× 4).

Aside from domestic Currants and Gooseberries (which see in Vols. I and II), Ribes contains few plants that are generally prized for cultivation. The most popular ornamental species is the Buffalo Currant, *Ribes aureum*, which is hardy and productive everywhere. The hybrid *R. Gordonianum* is also popular for its long clusters of bright pink flowers, its vigorous habit and its hardiness. *R. sanguineum* is also fairly well known, and is hardy in the northeastern states. There are horticultural forms with white, very dark red, and purple flowers. Some of the species are useful in shrubbery masses for their foliage and habit.

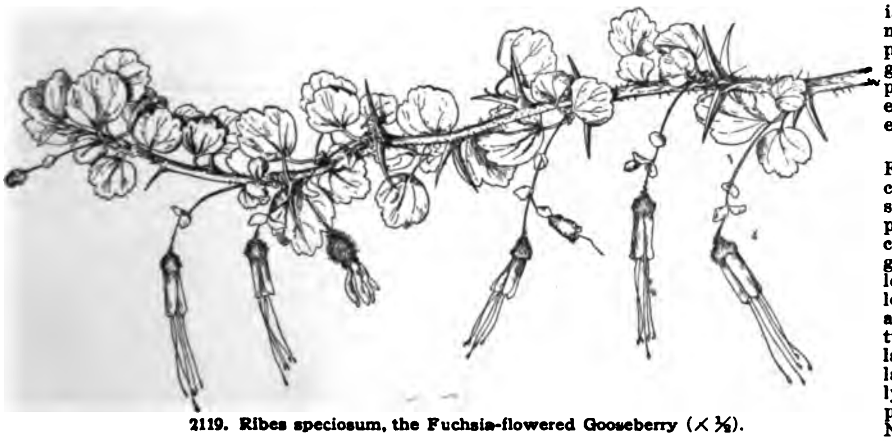
INDEX TO SPECIES IN AMERICAN TRADE.

albidum, 16.
album, 16.
alpinum, 11.
Americanum, 15.
atrorubens, 16.
aureum, 11, 18.
bracteosum, 13.
cereum, 19.
Chinense, 12.
Cynosbati, 5.
fasciculatum, 12.
flore-pleno, 16.
floridum, 15.
Gordonianum, 17.
Grossularia, 4.
hybridum, 17.
inebrians, 19.
Lobbii, 7.
lacustre, 6.
multiflorum, 8.
nigrum,14.
oxyacanthoides, 3.
prostratum, 9.
rotundifolium, 2.
rubrum, 10.
sanguineum, 16.
saxatile, 11.
setosum, 3.
speciosum, 1.
subvestitum, 7.
tenuiflorum, 18.
triflorum, 2.
Uva-crispa, 4.
variegatum, 16.
viscosissimum, 20.

A. *Stems bearing thorns below the leaf-clusters: branches often with numerous scattered prickles: berry sometimes prickly. (Gooseberries.)*

B. *Fls. red and showy, 4-parted: stamens long, exserted.*

1. **speciòsum**, Pursh. FUCHSIA-FLOWERED GOOSEBERRY. Fig. 2119. Branches covered with fine reddish prickles and glandular-tipped hairs: thorns long, slender, commonly in 3's: lvs. small, thick, shining, partially evergreen: peduncles slender, drooping, 2–4-flowered: fls. showy; calyx cylindraceous, ½–¾ in. long; stamens exserted ¾ in. or more beyond calyx, both bright red: berry small, prickly, dry, few-seeded. California. B.M. 3530. B.R. 18:1557. Gn. 31, p. 333; 34, p. 230.—The most showy member of the genus, but not hardy in the northern states.

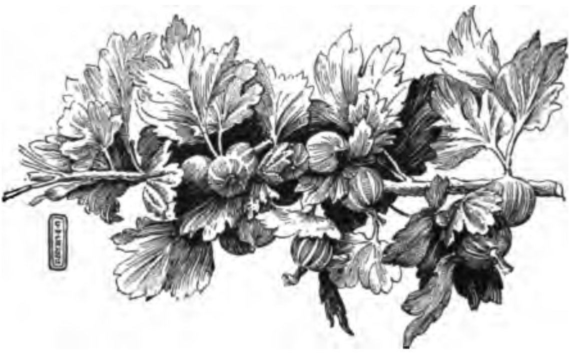

2119. Ribes speciosum, the Fuchsia-flowered Gooseberry (× ½).

BB. *Fls. greenish or dull purplish, small, 5-parted: stamens little or not at all exserted.*

C. *Berry smooth.*

2. **rotundifòlium**, Michx. Thorns mostly single, very short: lvs. wedge-shaped, smooth or slightly downy, ciliate on margins and veins: calyx-lobes narrow or oblong, greenish or dull purplish, shorter than the stamens; berry small, agreeable. Along the Alleghany mountains. L.B.C. 11:1094 (as *R. triflorum*).—Sometimes offered by dealers in native plants.

3. **oxyacanthoides**, Linn. Fig. 2120; also 926–9, Vol. II. Branches slender, reclined, but often crooked: thorns single or triple, slender, very finely pointed, ¼–⅜ in. long, sometimes nearly wanting: lvs. thin, roundish, cuneate to cordate, finely pubescent, glossy when growing: calyx greenish white, smooth or pubescent without; lobes oblong or obovate, thin and petal-like, equaling or exceeding the stamens; petals broadly ovate or spatulate, reaching half way to the anthers: ovary glabrous: berry round, perfectly smooth, but with delicate bloom, small or medium, red. Swamps and low grounds, eastern United States. B.M. 6892. B.R. 15:1237 (as *R. setosum*).—Parent of the representative American Gooseberries of gardens.

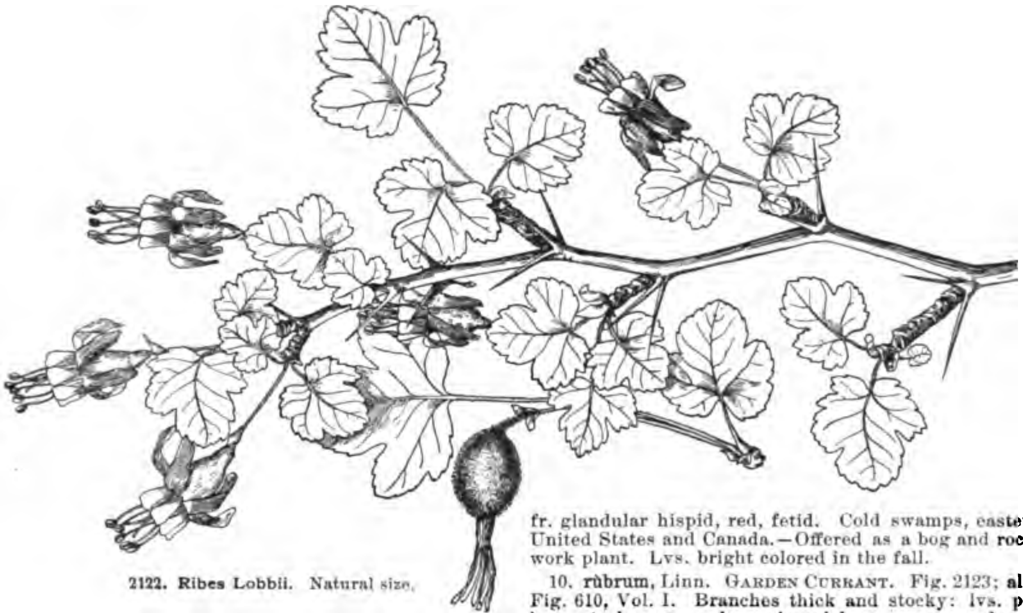

2120. Ribes oxyacanthoides (× ½).
Parent of the American garden Gooseberries.

CC. *Berry rough-hairy or prickly.*

4. **Grossulària**, Linn. (*R. Uva-crispa*, Linn.). EUROPEAN GOOSEBERRY. Figs. 922–5, Vol. II. Bush stocky, rigid: branches thick: thorns mostly triple, heavy and thick at base, the central one ⅜–½ in. long: lvs. thick, very glossy, pubescent: calyx strongly pubescent; lobes broadly ovate, thickish, leaf-like, longer than the stamens; petals obovate, reaching to base of anthers: ovary pubescent or glandular: berry generally oval, large, green, yellowish green or red, minutely but roughly pubescent, often with glandular hairs or prickles. Eu., northern Africa and western Asia.

5. **Cynósbati**, Linn. Fig. 2121. Thorns commonly single, slender, fine-pointed: petioles and peduncles pubescent and glandular; peduncles long, filiform: calyx-lobes narrow, oblong, acute, half as long as tube: ovary glandular-hispid: berry large, prickly or rarely smooth, reddish purple. Eastern North America.—Fruit edible, variable; sometimes cult. for its fruit, and worthy the attention of the plant-breeder.

6. **lacústre**, Poir. SWAMP GOOSEBERRY. Upright shrub, with many slender and straight prickles, and weak solitary or whorled thorns: lvs. cordate, with 3–5



2122. Ribes Lobbii. Natural size.

deeply cut or notched lobes, the stalks glandular: peduncles long and filiform: fls. small, reddish, open and the tube nearly wanting; berry small and bristly. Cold bogs, N. Eng. to Calif. B.M. 6492. L.B.C. 9:884.—Offered by dealers as a bog shrub. Intermediate between Currants and Gooseberries. Fls. in short racemes.

7. **Lóbbii,** Gray. Fig. 2122. Upright shrub, to 5 ft., the young shoots glandular-pubescent, without prickles, but provided with slender, mostly triple thorns: lvs. small (rarely 1 in. across), round-cordate, 3–5-cleft and notched, glandular on both surfaces: peduncles drooping, 1–2-fld.: fls. showy, with purple tube and reflexed lobes, the small, erect petals white, the anthers exserted: berry glandular-hairy. N. Calif. to B. C. B.M. 4931 (as *R. subvestitum*). G.C. II. 19:11.—Showy.

AA. *Stems thornless and prickleless.* (*Currants.*)

B. *Fls. small, wide open, greenish white or yellowish.*

C. *Lvs. without resinous dots: fr. red.*

8. **multiflòrum,** Kit. Younger parts pubescent, bearing glandular-tipped hairs: lvs. glabrous above, whitened downy beneath: racemes long, dense, pendulous: fls. green or reddish green: fr. dark red, large as a pea. Southeastern Europe. B.M. 2368. L.B.C. 14:1331.—Grown for ornament.

2121. Ribes Cynosbati (X ½).

9. **prostràtum,** L'Her. FETID CURRANT. Stems trailing and rooting, bearing erect branches: lvs. cordate, 5–7-lobed, the stalks long and slender: racemes erect, bearing flattish greenish white or greenish purple fls.: fr. glandular hispid, red, fetid. Cold swamps, eastern United States and Canada.—Offered as a bog and rockwork plant. Lvs. bright colored in the fall.

10. **rùbrum,** Linn. GARDEN CURRANT. Fig. 2123; also Fig. 610, Vol. I. Branches thick and stocky: lvs. pubescent when young, becoming glabrous: racemes drooping: fls. small, yellowish green or purplish; calyx saucer-shaped: fr. thin-skinned, shining, bright red, yellowish white or striped. Eu., Asia and N. Amer. R.H. 1861: 191.—Parent of all the domestic red and white Currants.

11. **alpìnum,** Linn. (*R. saxatile,* Hort., not Pall.). MOUNTAIN CURRANT. Branches upright, whitish: lvs. slightly hairy above: fls. yellowish green, diœcious, staminate clusters 20–30-fld., pistillate clusters 5–10-fld.: peduncles glandular-hairy: bracts longer than pedicel and flower: calyx flat: fr. smooth, scarlet, insipid or sweetish. Mountains of Europe and the Orient. L.B.C. 15:1486. Var. **aùreum,** Hort., has yellow foliage.

CC. *Lvs. bearing resinous dots on the under surface: fr. black.*

12. **fasciculàtum,** Sieb. & Zucc. Very like *R. alpinum.* Plant reaching 4 ft.: fls. all green, often imperfect, the male fls. somewhat larger than the female by reason of the longer sepals: lvs. firmer than those of *R. alpinum,* bright green, the lobes and serratures more obtuse, the younger ones pubescent below and on the nerves but becoming glabrate: fr. sweetish musky, scarlet. Japan.—Var. **Chinénse,** Maxim., from N. China, with lvs. soft-pubescent, is offered by Franceschi. S. Calif. M.D.G. 1899:571.

13. **bracteòsum,** Dougl. CALIFORNIA BLACK CURRANT. Strong, erect bush, often several feet high, glabrous or nearly so, the young growths resinous-dotted: lvs. large (sometimes 9 in. across, 5–7-cleft, coarsely and doubly serrate, hairy and resinous: racemes erect or ascending, 4–8 in. long, many-fld.: fls. small, greenish or purplish: berry ⅓ in. in diam., black and resinous-dotted, edible. N. Calif. to Alaska. B.M. 7419.

14. **nìgrum,** Linn. EUROPEAN BLACK CURRANT. Fig. 611, Vol. I. Stem upright: branches thick, grayish: lvs. sprinkled with minute bright yellow resinous dots beneath: racemes drooping, 5–10-fld.: fls. greenish white; calyx-tube broadly urn-shaped; lobes small, thick and greenish: ovary and calyx pubescent and resinous-dotted: fr. black, mawkish. Eu. and Asia.—Parent of the domestic Black Currants.

15. **Americànum,** Mill. (*R. flóridum,* L'Her.). AMERICAN BLACK CURRANT. Fig. 612, Vol. I. Bush spreading: branches slightly angular: lvs. bearing bright yellow resinous dots, few above, many below: racemes long, pendulous, many-fld.: fls. greenish white or yellow, ¼–⅜ in. long; calyx-tube bell-shaped, not resinous-dotted; lobes large, petal-like: ovary smooth: fr. black, resembling *R. nigrum* in flavor. Nova Scotia to Virginia, westward to Colorado and Manitoba.

BB. *Fls. large, tubular, red or yellow.*

C. *Racemes leafless.*

16. **sanguíneum**, Pursh. RED-FLOWERED CURRANT. Fig. 2124. Branches red, smooth; young parts pubescent or glandular-hairy: lvs. 2–4 in. broad, round-cordate: racemes long, pendulous: bracts obovate, membranous, as long as the pedicel: fls. purple-red or rose-colored; calyx, ovary and peduncles beset with short, glandular-tipped hairs: fr. bluish black, rough, glandular-hairy, dry and bitterish. British Columbia, through California and Mexico to South America. B.M. 3335. B.R. 16:1349. Gn. 51:1110.

Var. **variegàtum**, Watson. Bush low: racemes short and dense, ascending, barely glandular: lvs. thicker, downy beneath.

Var. **álbidum**, Hort. (*R. albidum*, Hort.), is a form with whitish, dirty yellow or yellowish red flowers and light-colored fruit. R.H. 1843:419. Gn. 51:1110 (as *R. album*). Var. **atrórubens**, Hort., one with dark, blood-red flowers. Var. **flòre plèno**, Hort., has dark, clear double flowers. R.H. 1845:245. G.C. II. 14:144. All the forms of this species are worthy ornamental plants.

17. **Gordoniànum**, Lem. A hybrid between *R. sanguineum* and *R. aureum*, intermediate in character: fls. resemble *R. sanguineum*, but lighter: bush resembles *R. aureum*, but generally fruitless. F.S. 2:165 and plate. Gn. 51:1110 (as *R. hybridum*).—Of English origin. Hardy and useful.

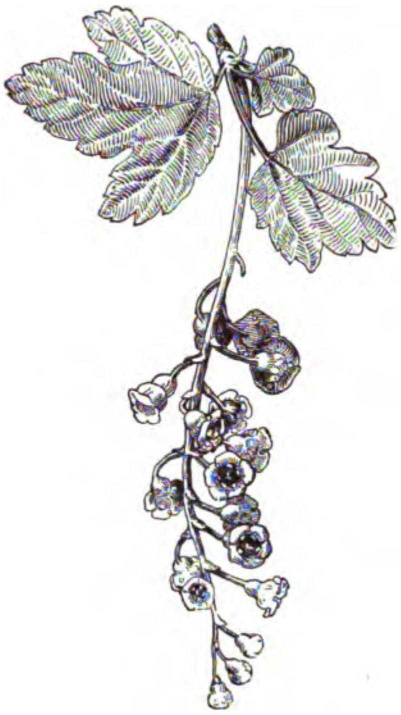
CC. *Racemes leafy.*

18. **aûreum**, Pursh. MISSOURI, FLOWERING, GOLDEN or BUFFALO CURRANT. Fig. 2125; also Fig. 613, Vol. I. Plant free-growing, sprouting from root: lvs. cuneate or truncate, smooth, shining, when very young densely covered with brown or yellow resinous beads, which disappear with age: peduncles short, few-fld.; bracts large, leaf-like: fls. spicy-scented, yellow and showy; calyx-tube ⅜–½ in. long; petals red: fr. dark brown or black, with bluish bloom. Mississippi valley to Rocky Mts. B.R. 2:125.—Much grown for its yellow fragrant flowers. It has given rise to the Crandall and some other fruit-bearing sorts.

Var. **tenuiflòrum**, Torrey. Leaves light green, broadly 3–5-lobed: fls. usually scentless: berries amber-colored, approaching a pale cherry-red, acidulous, without aroma. The Pacific coast, eastward beyond the Rocky Mts. B.R. 15:1274.

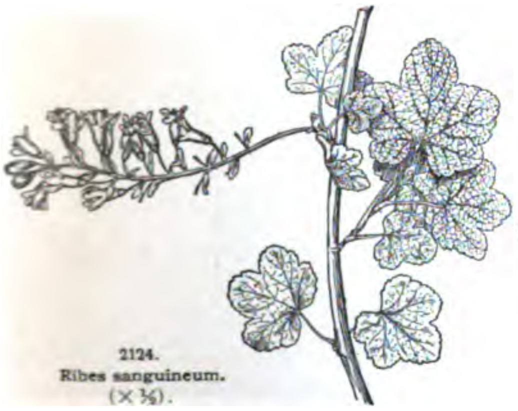
19. **cèreum**, Dougl. Fig. 2126. Upright branching shrub, reaching 3–4 ft., the young parts minutely pubescent and more or less glutinous: lvs. nearly orbicular to reniform, rather small (seldom more than 1 in. across), 3–5-lobed and crenate-toothed, waxy-dotted: racemes short and drooping, glandular-hairy: fls. ⅓ in. or less long, narrow tubular, white or pinkish: fr. bright red, rather small, sometimes glandular, sweet but mawkish. Rocky Mts. and west. B.M. 3008. B.R. 15:1263; 17:1471 (as *R. inebrians*).—Sometimes grown for ornament.

20. **viscosíssimum**, Pursh. Branchy, upright, to 6 ft., the young growths viscid: lvs. round-cordate, 3 in. or less wide, 3–5-lobed with obtuse doubly crenate somewhat out divisions: racemes erect, viscid: fls. large, fragrant, yellowish or whitish green, the calyx-lobes not reflexed, the petals small and white: berry black, mostly glandular-hairy, scarcely edible. Rocky Mts. and west.

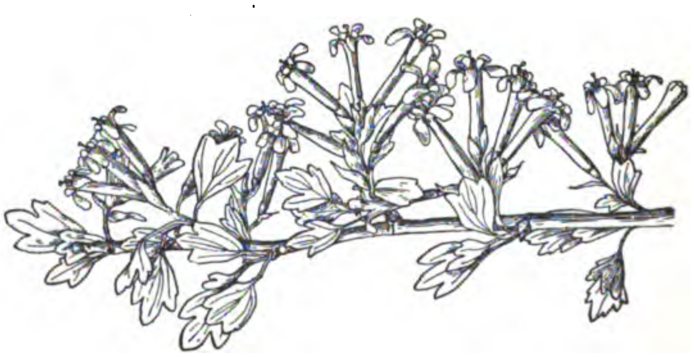


2123. Ribes rubrum, the common Currant. Natural size.

R. acerifòlium, Hort.=rubrum.—*R. amictum*, Greene. Fls. large, showy, purple. Related to Californicum. California.—*R. Bèatonii*, Hort.=Gordonianum.—*R. Califórnicum*, Hook. & Arn. Branches zigzag: fls. showy: fr. very prickly. Calif.—*R. cognàtum*, Greene. Related to leptanthum. Ore.—*R. curvàtum*, Small. Related to gracile. Ga.—*R. erythrocárpum*, Coville & Leiberg. Trailing: related to prostratum. Ore. G.F. 10:184.—*R. fràgrans*, Lodd.=R. aureum.—*R. glutinòsum*, Benth. Related to R. sanguineum: blooms earlier: fr. large as a Gooseberry. Pacific Coast.—*R. grácile*, Michx. Fls. fragile, finely divided: fr. good. The Gooseberry of the Plains. Mississippi Basin.—*R. Hudsoniànum*, Rich. Resembles R. nigrum in fruit and odor. Hudson Bay region and northward.—*R. leptánthum*, Gray. Sturdy, rigid shrub: lvs. and fls. small: berry smooth. Rocky Mts., westward.—*R. Loùdoni*, Hort.=R. Gordonianum.—*R. malvàceum*, Smith, Resembles R. sanguin-



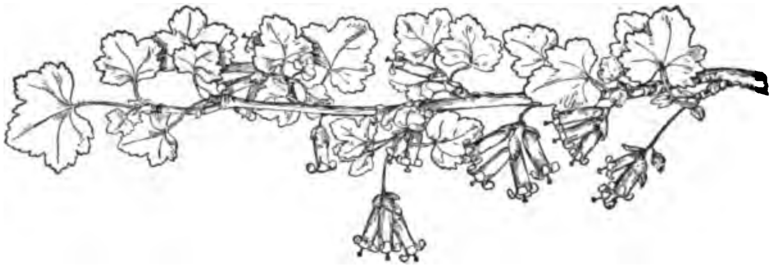
2124. Ribes sanguineum. (× ⅓).



2125. Yellow-flowering Currant—Ribes aureum (× ⅓).

eum, but less ornamental. Calif. Card, p. 480.—*R. Ménziesii*, Pursh. Extremely prickly both in plant and fruit. Calif. and Ore. B.R. 33:56.—*R. Missouriénse*, Hort.=R. Americanum.—*R. Mogollónicum*, Greene. Perhaps the western representative of R. Americanum. New Mex.—*R. odoràtum*, Hort.=R. aureum. —*R. subvestìtum*, Hook. & Arn. Related to R. Menziesii: fr. densely glandular-hispid. Coast Ranges of Calif.—*R. viburnifòlium*, Gray. Lvs. scarcely lobed, resinous-dotted with peculiar pebbled, leathery appearance. Lower Calif.—*R. Watsoniànum*, Koehne. The western representative of R. Cynosbati. Washington.

FRED W. CARD.



2126. Ribes cereum (× ⅔.

RÌCCIA (P. F. Ricci, Italian nobleman, patron of the botanist Micheli). *Ricciàceæ*. *Riccia fluitans*, Linn., is one of the few flowerless or cryptogamous plants in cultivation aside from the ferns, mushrooms and selaginellas. It is cultivated by one specialist in aquatics presumably for the benefit of students of botany. It is not generally advertised among aquarium plants. In this family of plants the plant-body is a thallus (i. e., a green, flattish body not differentiated into root, stem and leaves). The thallus of Riccia spreads out in green patches which are at first radiately divided, and the center of the plant often decays quickly. *R. fluitans* is distinguished from other species by the linear, dichotomous, floating thallus, with the capsule protuberant from the lower surface. For full description, see Gray's Manual.

RICE. See *Oryza.*

RICE FLOWER. *Pimelia.*

RICE, MOUNTAIN. *Oryzopsis.*

RICE PAPER. The Chinese rice paper is made from *Fatsia Japonica*, which see.

RICHÁRDIA (L. C. Richard, 1754–1821, French botanist). *Aràceæ.* CALLA LILY. Perennial herbs with many long-petioled leaves from a thick rhizome: peduncles appearing with the leaves: petioles spongy, often bristly below; blade sagittate or lanceolate, the numerous primary and secondary nerves excurrent: peduncle as long or longer than the leaves; spathe large, open, with a flaring, pointed, recurved tip: spadix staminate above and pistillate below (Fig. 2127). Differs from Peltandra in floral characters. So. Africa. Species 10–12. See Gn. 46:446; R.B. 23:13. Engler, DC. Monogr. Phaner, vol. 2. The true Calla is not of this genus; see *Calla*. For the Black Calla, see *Arum*.

When grown for the flowers only, Richardias may be planted out permanently on a bench, using very rich soil and giving an abundance of water while growing. They may be kept growing continually or given a season of rest as desired. Plants in pots are usually started late in summer from dry tubers. The species having yellow and pink spathes seem to do best when grown without a resting period.

A. *Leaves lanceolate.*

Rèhmanni, Engler. PINK or ROSE CALLA. Dwarf perennial: lvs. lanceolate: spathes about 4 in. long, erect, trumpet-shaped, with a caudate tip 1 inch long. B.M. 7436.—In Natal the spathes are said to be dull rose without, rose-purple within, with a dark crimson blotch at the base inside. In cultivation the spathes are white, with a faint rose tinge to the back and margins.

AA. *Leaves sagittate or cordate.*

B. *Foliage spotted.*

albo-maculàta, Hook. SPOTTED CALLA. Fig. 2128. Petioles short; blade 12–18 in. long, white-spotted all over, hastate, three to four times longer than broad, acute, the basal lobes widely spreading, triangular, obtuse or acute, 3–4 in. long: spathe trumpet-shaped, 4–5 in. long, 2 in. wide, dull creamy yellow with a blotch of crimson at the base. B.M. 1540. I.H. 7:255. F.S. 21:2258.—Will stand in the open with good protection for the roots. Not of much value except in botanical collections.

Nélsoni, Hort. Allied to *R. albo-maculata:* very vigorous and floriferous, reaching 3–4 ft., the scape overtopping the foliage: lvs. sagittate, bright green, sprinkled with pellucid dots or spots, as in *R. Elliottiana:* spathe scarcely spreading, the limb short, very pale yellow with a purple blotch at the bottom.—One of the most recent species.

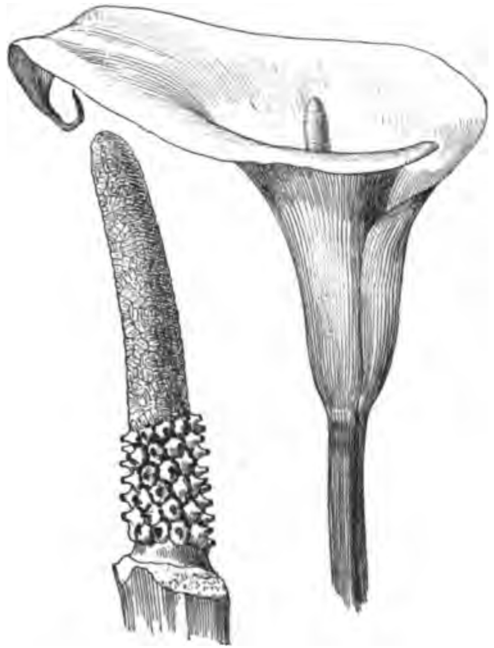
melanoleùca, Hook. f. BLACK-THROATED CALLA. Scape and petioles bristly below: lvs. 6–12 in. long, hastate-ovate-acuminate, the basal lobes obtuse, marked all over with oblong, white, translucent spots: spathe pale straw-colored, widely flaring and open from the base, the margins and cuspidate tip recurving, with an ample black-purple spot at the base within. Natal, 1868. B.M. 5765.

Elliottiàna, Knight (*Cálla Elliottiàna*, Hort.). GOLDEN CALLA. Petiole mottled; blade light green, with a few white or translucent spots, broadly sagittate, with undulate margins, about as large as those of *R. Africana:* spathe a rich lustrous yellow, lasting about two weeks, becoming greenish with age. Tuber proliferous. S. Africa, 1890. Gn. 46:989.

BB. *Foliage without spots.*

C. *Base of the leaf-blade cordate.*

Africàna, Kunth (*Cálla Æthiòpica*, Linn. *R. Æthiòpica*, Hort.). COMMON CALLA. LILY-OF-THE-NILE. Fig



2127. Common Calla Lily—Richardia Africana (× ½). Left-hand specimen shows the spadix, the spathe being removed.

2127. Blade about twice as long as wide, cuspidate at the apex, cordate-sagittate at the base, both leaves and spathes varying greatly in size: spathe 3–10 in. long, white, creamy inside at the base, flaring outwards and narrowing to a cuspidate tip. S. Africa. B.M. 832. Gn. 33:654.—Fragrant. Sports with double and triple spathes often occur. A.F. 5:83. Gn. 46, p. 447. See Fig. 2129.

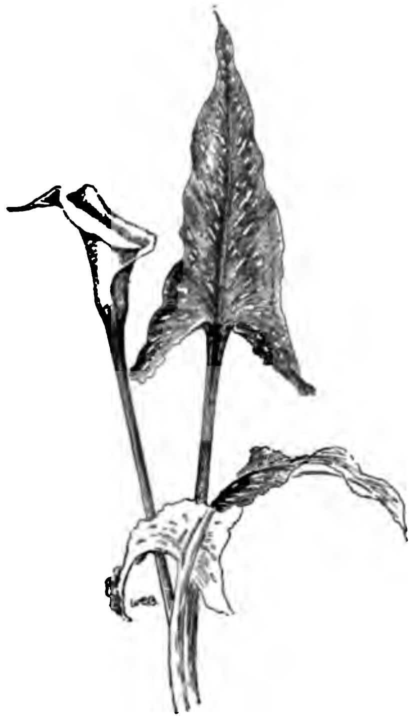
Var. **nàna compácta**, Hort. (*R. nàna compácta*, Hort.). LITTLE GEM. Fig. 2130. Like the type, but only 12–16 in. high: spathes 3–4 in. long. Var. **Devoniénsis**, Hort. (*R. Devoniénsis*, Hort.). Dwarf; freer bloomer than Little Gem, and more fragrant.

There are many forms of the Calla Lily in cultivation, a number of which have received Latin names. Some of these horticultural names are: **candidissima**, spathe large, pure white; **gigantèa**, plant very large; **Godefreyàna**, dwarf, white; **grandiflòra**, spathe large.

Péntlandii, Whyte. Erect perennial: lvs. ovate-cordate, acuminate-caudate, with an open sinus, basal lobes rounded: midrib thick: spathe golden yellow, broadly trumpet-shaped, its lower margins convolute one third, flaring above, the subulate tip abruptly recurved, margins recurved, slightly warty and with a black-purple blotch at the base within. Basutoland, S. Afr. B.M. 7397.—Hooker writes (in B.M. 7397) that "*R. Pentlandii* is much the largest-leaved species, and is the only one with a deeply gamboge yellow spathe within, which is much the largest and broadest of any." First flowered in 1892 by R. Whyte, Pentland House (Lee, England).

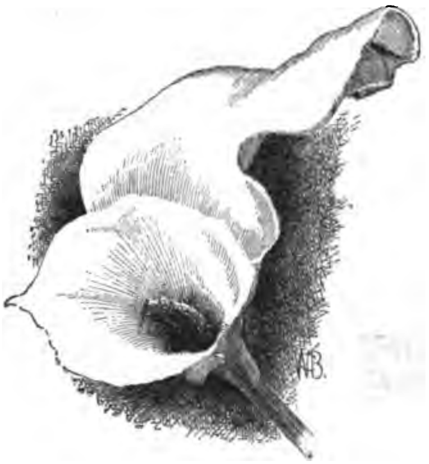
CC. *Base of the leaf-blade hastate.*

hastàta, Hook. f. (*R. Lutwýchei*, N. E. Br.). PRIDE OF THE CONGO. YELLOW CALLA. Petioles bristly below: blades dull green, hastate-ovate, twice longer than wide, rather flaccid, 8–16 in. long, cuspidate at the apex, basal lobes separated by a narrow sinus: spathe cup-shaped, 5 in. long (with a tail 1 in. long), greenish yellow, the tip erect, black-purple at the base within, the lateral nerves usually rather prominent above. B.M. 5176. Gn. 18:262.



2128. Richardia albo-maculata (× 1-5).

R. Ádlami, Hort. Leichtlin. Strong-growing, with lvs. sagittate, bright green, and somewhat exceeding the scape: spathe short and rather open, creamy white with a black or purple throat. S. Afr. Distributed by Max Leichtlin (Germany) in 1898. There are hybrids of this and R. Elliottiana.—*R. angustiloba*, Schott. Leaf-blade hastate, narrow, the basal lobes one-fourth the length of the apical one, 20 in. long, 3 in. wide at the base: peduncle 4–4½ ft. long. Angola.—*R. auràta*, Hort., said to be a hybrid of hastata and albo-maculata, but better regarded as a variety of hastata: leaves spotted; spathes large, yellow. Said to be a hybrid of R. albo-maculata and R. hastata.—"*R. suffùsa*. A distinct dwarf-habited plant with a creamy white spathe, the base in the inside of a rich violet-purple shade. It is apparently a plant of good constitution." Gn. 55, p. 317.



2129. Calla with double spathe (× ¼).

JARED G. SMITH.

Culture of Callas.—Richardia Africana has been known for generations as the Calla Lily. Though often grown as a window plant, it is very unsuitable and seldom blooms under house treatment. When grown for winter flowers, it is customary to give the roots a rest during summer time. They may be dried and stored if necessary. It is in this condition that we get Californian Callas. It is the opinion of the writer that summer-resting would be the best treatment for those grown as house plants, as well-grown dried roots are more likely to bloom. But rest must be enforced, for Callas will grow all the year round, increasing in size and numbers when planted out. We always get the largest blooms from summer-grown plants. They are taken up in the autumn, given good loam and plenty of root-room, with a liberal allowance of liquid fertilizer when well established. They thrive best under good light, and in a minimum temperature of 55°.

There are several varieties, all differing only in size, from those which grow six feet to "Little Gem"—one foot. Some are said to be more odorous than others, though all are fragrant. Besides being invaluable pot-plants, they can be used with good effect in indoor winter gardens, growing luxuriantly when partly submerged; and also in "bog" gardens, and on the margins of ponds, to give subtropical effects.

R. Elliottiana, although introduced to cultivation about ten years ago, is yet rare. It is undoubtedly an acquisition. It is a South African species, about which we know comparatively little. From what scraps of information we have gathered regarding it from time to time, we conclude it is rather an upland species, and our experience with it would indicate that frost may occasionally visit its habitat, or at least that it will endure a lower temperature than *Richardia Africana* and succeed. When introduced, we thought it difficult to grow. It was first grown in this country by William Robinson, gardener to F. L. Ames, North Easton, Mass., Mr. Harris, gardener to H. H. Hunnewell, Wellesley, Mass., and Mr. Joseph Tailby, of Wellesley. The last named is a commercial grower, who looked upon his importation as an investment. The bulbs (corms or roots) were expensive,—a guinea or thereabouts—and about as big as marbles. Mr. Tailby now has bushels of them, and some as large as turnips, —anyway, four inches in diameter. Tailby's experience is interesting and it may be valuable to the reader. He came near losing his whole stock by cutting out the eyes, with the object of getting separate plants. There had been no sign of natural division, nor has there since; though Mr. Tailby is still of the opinion that by proper manipulation they may be increased by division, as we now do potatoes, but the wounds must be given time to heal over. The roots are kept over in a cellar at a temperature of 45° F., or thereabouts, until April, when they will show signs of starting. They should be potted then, but kept rather dry until the roots develop. The pots will be fairly well filled with roots before much growth shows, and we can keep them under benches in a cool house, or even in the cellar, for two weeks after potting. With the roots well started, they come along quickly, coming into bloom in 10–12 weeks. A good bright, intermediate house suits them best, and some liquid fertilizer will help them when the flower-stems appear. The blooms last a long time, opening greenish yellow, turning to pure orange-yellow, and finally green when aging. Seeds are formed plentifully; and by these, though slow, is yet the surest and quickest method of propagation. During the ripening period of seeds, they must have the very best attention. They usually do not become thoroughly ripened until August. Pot-grown plants are better stored in pots. The whole culture is easy when we know it.

Seeds germinate quickly. Those sown in November come up strong, but the plantlets are difficult to handle and liable to go off when very young. It is the safest way to let them stay in the seed-boxes, ripen there, and plant them farther apart next season. This is what we have been doing and we cannot complain of the results. Tailby has sown seeds outdoors with very gratifying results. Almost a year is gained in this way, as the roots (or bulbs) are considerably larger than box-grown seedlings. Older roots held over until settled weather, and, planted like potatoes, bloomed freely all summer, making fine roots; they were green when cut by frost in October, but hardly ripening seeds. To do this takes a longer season, and the plants must be started indoors.

2130. Richardia Africana, Little Gem (× ⅙).

T. D. HATFIELD.

The Richardia in California.—In considering the Calla in California, it is necessary to treat it under two general heads: first, as an ornament; and second, as an article of commerce. The popular and growing demand for Calla bulbs (or tubers) speaks much for the plant as an ornamental. Many, indeed, are the uses to which it is put. It is, perhaps, most commonly used as a belt along fences, and not infrequently as a hedge between two properties; or nearly as often is found along one side of a house in a long, narrow bed. For effective planting it is much in demand for grouping around hydrants and unsightly objects in damp places, at watersides; sometimes as a border around a fish or lily pond, oftentimes growing in bunches or masses in the water itself; or massed on a slope near water; mixed with other tropical vegetation; or as a border to tropical jungles; and very effective, indeed, is it in the lower tiers of basins around a large fountain with Myriophyllum hanging down from the base of the Callas. For all of these purposes the foliage is of even more importance than the flowers. As it grows luxuriantly here in almost any location, it is very seldom seen as a pot-plant either in the dwelling or on sale at the nurseries. In the most favored places only is it entirely secure from the frost, though the damage to it from this source is not serious in or around Los Angeles. Though doing fairly well in the full sun, our summer climate is too dry for it to attain its greatest beauty and luxuriance wholly without protection, and it may therefore only be seen in perfection when grown in partial shade. A good supply of water and manure is also an important factor in its proper development.

The spathe is subject to many variations in form, both in size and shape, some being long, rather narrow, and pointed, ending in a decidedly recurved awn, while others are nearly circular, with the sharp point almost wanting and standing upright the same as the balance of spathe. It frequently happens that the spathe is double and even triple, sometimes in its entirety but often only partially so. In the latter case it often assumes some very strange forms. The spadix is not so variable and seldom departs from the type, though an occasional double or abnormal spadix is found. Other species or varieties than *R. Africana* are found, but sparsely in California gardens, the most common ones being the spotted-leaved and the dwarf form known as the Little Gem.

Commercially, the growing of the bulbs for eastern and foreign markets is a sure source of revenue, and is carried on extensively throughout southern California. The local market for the so-called flowers is of course limited, but if grown in a practically frostless belt, the blooms will more than pay for the cultivation of the winter field, as in that season of the year flowers of all kinds are scarce. The average retail price for good blooms in midwinter is 50 cents per dozen; the wholesale price about $1 per 100. Bulbs at retail cost about one-half, or even less, what they do in the East. Our commercial growers get at present (January, 1901), $25 to $60 per 1,000, according to size, the market calling for tubers 1½ to 3¼ inches in diameter. Larger sizes are quoted as "fancy" and command extra prices. Though they can be grown in almost any soil with some success, a free, cool, blackish loam is best, and they do not thrive in a hot, gravelly or stony soil. The lands near the coast, where swept by the cooling sea breeze, are productive of the best results, both in bloom and tuber. Land containing sufficient alkali to prevent the growth of many common crops will produce good Callas if other requirements are present. In field planting it is much better to put in small bulbs about 4 inches apart than to sow the offsets promiscuously in the row; when the sets are thus sown, they should be taken up the following year and the small bulbs properly planted. Offsets sown as above and left 4–6 years (the usual time for a good crop) have never produced satisfactory results. No pest seriously attacks foliage or bloom, but in dry years more especially, the common sow-bug eats into the tubers very seriously and receives considerable assistance from millipedes. Both these pests are quite a nuisance to the California nurseryman and gardener. The much-photographed "Acres of Callas in Bloom," so familiar to visitors and much used to illustrate articles on California, fancy stationery, etc., was grown by Capt. M. E. Walker, of Los Angeles, to whom the writer is indebted for many of the leading facts in this article regarding the culture of the Calla for the general market.

ERNEST BRAUNTON.

RICÌNUS (Latin name, from the resemblance of the seeds to certain insects). *Euphorbiàceæ*. Herbaceous or becoming tree-like in the tropics, glabrous: lvs. large, alternate, peltate, palmately 7- to many-lobed, the lobes serrate, monœcious: fls. without petals or disk, in terminal and apparently lateral racemes, large for the order: the upper short-pedicelled or sessile and staminate; calyx 3–5-parted, valvate; stamens many, erect in the bud.

2131. Fruit of Castor Bean, showing the seeds inside.

Natural size.

filaments much branched, each with very many anthers; rudiment of pistil none: the lower fls. longer pedicelled, pistillate; sepals very deciduous; styles 3, plumose: capsule 3-loculed, 3-seeded, explosively separating into 2-valved coccæ when ripe: seeds ovoid, with a large caruncle, crustaceous testa and fleshy, oily albumen; cotyledons broad.

2132. Ricinus communis.

A great many forms are known, many of which have been distinguished as species by some, but most botanists follow Müller (DeCandolle's Prodromus, vol. 15, part 2:1061, 1866), in referring them all to varieties of the one species, *R. communis*, Linn., in which the following, listed as species in the American trade, may doubtless be placed: *R. Africànus, Borboniénsis, Cambodgénsis, cærùleus, Gibsoni, gigantèus, macrocárpus, macrophýllus, Obermanni, Philippinénsis, sanguíneus, spectábilis, trícolor, Zanzibarénsis.* See Vilmorin, Blumengärtnerei, p. 903 (1896).

commùnis, Linn. Castor Bean. Castor Oil Plant. Palma Christi. Figs. 2131–3. Half-hardy annual, 3–15 ft. high in the central United States, 30–40 ft. in the tropics. The large handsome leaves (6 in.–2½ ft.) and stems bright green to dark red: capsules prickly or smooth. July to frost. Probably originally from Africa or India, now scattered widely and naturalized in all tropical lands. B.M. 2209.—Cultivated in most tropical and temperate countries from the earliest times, for the oil of the seeds (castor oil, *Oleum Ricini*) used in medicine and in the arts, and in some places as a food-dressing oil. The seeds contain a poisonous principle. Also much used as a decorative plant singly or in bed centers, giving a rich tropical effect. Of rapid growth in any rich soil. The seeds may be planted in May where they are to grow, or sown singly in pots in early spring and afterwards transplanted. The species varies greatly in size and in the form and size of the capsule, the form, size and color of the seeds and color and glaucosity of the stem and leaves. The following are some of the principal varieties: Var. **Cambodgénsis**, Hort. Lvs. dark colored; stems nearly black. Var. **Gíbsoni**, Hort. Dwarf, 5 ft., lvs. bronzy purplish. Var. **lívidus**, Jacq. (*R. sanguíneus*, Hort. *R. Obermanni*, Hort.) Slender; stem and fruit blood-red, 8 ft. R.H. 7:182,183. Var. **Borboniénsis**, Hort. Fifteen feet, lvs. large, shining, green or reddish. Var. **Zanzibarénsis**, Hort. A recent introduction of large size with enormous various colored lvs. and very large flat seeds. A.G. 16:383. I.H. 41:100.

J. B. S. Norton.

RIGIDÉLLA (Latin, *somewhat rigid;* referring to the pedicels, which after the petals fall become erect and stiff). *Iridàceæ.* A genus of 3 species of Mexican half-hardy bulbous plants allied to the well-known Tigridias and distinguished by the inner perianth-segments; these are inconspicuous in Rigidella, being very small, ovate and erect, while in Tigridia they are larger, fiddle-shaped and spreading. Lvs. broad, plicate, with channeled petiole; fls. fugitive, bright red, pedicelled; perianth-tube none; segments very unequal, outer oblong, connivent in a cup in the lower third, then spreading or reflexed; inner very small, erect, ovate, with a narrow claw. Baker's Irideæ, Baker, p. 70.

immaculàta, Herb. Stem 2–3 ft. long, forked: lower lvs. 1½–2 in. long including petiole: fls. bright crimson, not marked with black. B.R. 27:68. F.S. 5:502; 21:2215 (fls. brick-red).

F. W. Barclay.

RIVÌNA (A. Q. Rivinus, professor of botany, etc., at Liepzig, 1691–1725). *Phytolaccàceæ.* A genus of 2 or 3 species of shrubs with herbaceous branches bearing usually axillary racemes of small flowers, followed by red berries the size of peas. Lvs. ovate, ovate-lanceolate or cordate-ovate: perianth-segments 4, small, equal; stamens 4–8; style short; stigma capitate. The species are natives of tropical America. The following makes a good pot-plant for a warm greenhouse, and it is also useful for growing as a summer annual in the open.

hùmilis, Linn. Rouge Plant. Fig. 2134. Stem with spreading branches, ½–2 ft. high: lvs. 1–3 in. long: racemes slender, pendulous, many-fld., as long as the lvs.: fls. white, 1–1½ lines long: calyx pale rose: fr. 1–1½ lines long; S. Florida. B.M. 1781. V. 5:75. S.H. 2:111. Gn. 22, p. 68 (as *R. lævis*).

F. W. Barclay.

ROAN or **RÒWAN**. *Sorbus Aucuparia.*

ROBÌNIA (in honor of the two early French botanists Robin). *Leguminòsæ.* Trees or shrubs, with odd-pinnate leaves and often spines for stipules: lfts. stipellate: fls. in drooping axillary racemes: fr. a 2-valved pod or legume, with several bean-like seeds. A genus of plants of much merit for ornamental planting, and in one case for its enduring timber. All are of rapid growth when young, reaching effective stages in a short time. The facility with which they increase, both by seed and by suckers, is sometimes a disadvantage. Varieties are propagated by cuttings or by grafting. The

2133. Clump of Ricinus communis.

beauty of *R. Pseudacacia* was early recognized and it was extensively planted, but the attacks of the borer have caused great loss and checked the planting of a beautiful tree.

2134. **Rivina humilis** (× ⅛). (See page 1537.)

Pseudacàcia, Linn. LOCUST. FALSE ACACIA. BLACK LOCUST. Fig. 2135. This species is the largest of the genus, growing to a height of 80 ft. Lfts. short-stalked. 9–19, 1–2 in. long, oval or ovate, smooth, often emarginate or mucronate: bark on young wood brown and glandular; stipules glandular, enlarging with age and becoming strong thorns on the 2-year-old wood: fls. white and fragrant, in drooping racemes: fr. a broad, brown, many-seeded pod or legume. May, June. Eastern N. A.—Wood very lasting, and adapted to many uses. Many varieties of this species are in cultivation, the following being sold in this country: **aùrea,** Hort., has pale yellow lvs.; **bella-ròsea,** Hort., rose-colored fls., and is probably a hybrid of *R. Pseudacacia* and *R. viscosa*; var. **inérmis,** DC., is a thornless variety, with large dark foliage; **bullàta,** Hort., is much like Bessoniana (below), but more compact; **Decaisneàna,** Carr., is a form with handsome rose-tinted fls. R.H. 1863:151. F.S. 19:2027. I.H. 12:427. Gn. 34, p. 174; **spectábilis,** Du Mont Cour., is a strong-growing thornless var.; **monophýlla,** Pelz. & Kirchn., is the Single-leaf Locust, and of this there is a slightly pendulous sub-var.; **péndula,** Loud., is a form with broad, spreading, somewhat drooping branches; **semperflòrens,** Hort., is said to flower throughout the summer; vars. **glóbula, stricta** and **mimosæfòlia** are horticultural forms, which are sufficiently described by their names; **pyramidàlis,** Pelz. & Kirchn., is a distinct narrow-growing form; **umbraculifera,** DC. UMBRELLA LOCUST. Thornless, the glabrous branches densely crowded: lfts. ovate. Vars. *rubra, stricta* and *Bessoniana* are forms of this. Very distinct.

híspida, Linn. ROSE ACACIA. Fig. 2136. A shrub 2–8 ft. high, all parts of the plant except the fls. bristly or hairy: lfts. 9–13: racemes loose: fls. on long pedicels, rose color. May, June. Va. to Ga., in mountains. B.M. 311. Gn. 34, p. 175.—Like the next species, it spreads from the root and should be planted where it will not interfere with other plants. Seldom matures seed.

viscòsa, Vent. CLAMMY LOCUST. A small tree, rarely growing to the height of 30–40 ft.: shoots, petioles and seed-pods covered with viscid-glandular hairs: lfts. 11–25: fls. in a short and usually rather erect raceme, rose color. June. Va. to Ga., in mountains. S.S. 3:115. B.M. 560.—The var. **bella-ròsea,** Nich., is *R. Pseudacacia*, var. *bella-rosea*.

Neo-Mexicàna, Gray. A shrub 5 or 6 ft. high, with stout stipular prickles: peduncle, raceme and calyx glandular-hairy: fls. in drooping axillary racemes, rose color. Southwestern N. Amer. S.S. 3:114. Gt. 41:1385.

R. Kélseyi is "a new species discovered and introduced in 1901, by Harlan P. Kelsey. The bark much resembles R. Pseudacacia, and the plant is sparingly pubescent. It is a compact shrub of distinct habit."

JOHN F. COWELL.

ROBIN'S PLANTAIN, *Erigeron bellidifolius.*

ROCAMBOLE (*Allium Scorodoprasum*, Linn.), is a humble member of the onion tribe, the underground bulbs of which are used abroad like garlic, known in America amongst the Canadian French. The plant is a hardy perennial, with a stem that is twisted spirally above and bears at the top an umbel of flowers, some or all of which are changed to bulblets. The presence of these bulblets distinguishes the plant from garlic. The species can be propagated by the bulblets, but quicker results are secured from the cloves of the underground bulbs. In mild climates, the bulbs should be planted in autumn or not later than February; in cold climates, plant in spring. In the autumn when the leaves decay, the bulbs are lifted, dried in the sun, and stored.

Rocambole is a native of Europe, the Caucasus region and Syria. It has flat or keeled leaves, short spathe, bell-shaped, 6-parted perianth, and the 3 inner stamens broader than the rest, 3-cleft, and not longer than the perianth. It is a perennial plant. Good seeds are rarely produced.

ROCCÁRDIA. Consult *Helipterum.*

RÒCHEA (de la Roche, French botanist). *Crassulàceæ.* A genus of 4 species of succulent plants from S. Africa, with opposite, oblong-ovate or lanceolate lvs. and fls. in terminal, few-to many-fld. heads. For generic characters, see *Crassula.* The best species is *R. coccinea.* The following points concerning its culture are condensed from Gn. 46, p. 360: This species enjoys an abundance of light and sun-heat, and needs to have its wood thoroughly ripened in the autumn to insure a display of bloom. If small plants can be procured they should be nipped about February 1. If a few leaves are removed, after the top is pinched out, shoots will start more evenly. After pinching, the plants are put into considerably larger pots, a peaty soil being generally used and good drainage given. They should be given a night temperature of 50°, day temperature of 75–80° in sunshine, with plenty of atmospheric moisture until the new growths are freely produced, when they should be inured to more air. A shading of the glass may be necessary in summer, or the plants may be placed in a sheltered position outside. About August, when the plants have made as much growth as can be ripened that season, they may be placed in a warm, dry, sunny

2135. **Robinia Pseudacacia** (× ⅓).

place to induce perfect and early maturity. During winter the plants may be kept in a sunny frame or cool, light greenhouse, with only sufficient water to prevent shriveling.

A. *Clusters usually 2-flowered.*

jasmínea, DC. (*Crássula jasmínea*, Ker-Gawl). Stem herbaceous, 4–12 in. high, decumbent, branched, flowering part erect: lvs. fleshy, oblong-oval, ½–¾ in. long, 1–2 lines wide: fls. white, tinted with crimson, sessile, not fragrant, 1⅛ in. long. B.M. 2178.—Hybrids with *R. coccinea* are figured in A.F. 5:433.

2136. Rose Acacia—Robinia hispida. (X ½.)

AA. *Clusters many-flowered.*

coccínea, DC. (*Kalosánthes coccínea*, Haw. *Crássula coccínea*, Linn.). Plant robust, shrubby, 1–2 ft. high: lvs. very closely imbricated, 1–1⅛ in. x ¾–1 in.: fls. bright scarlet, 1⅛–2 in. long, fragrant, borne in summer. Cape. Gn. 46, p. 360. B.M. 495.

R. falcáta, DC. See Crassula falcata. F. W. Barclay.

ROCK-BRAKE. See *Cryptogramma.*

ROCK-CRESS. *Arabis.*

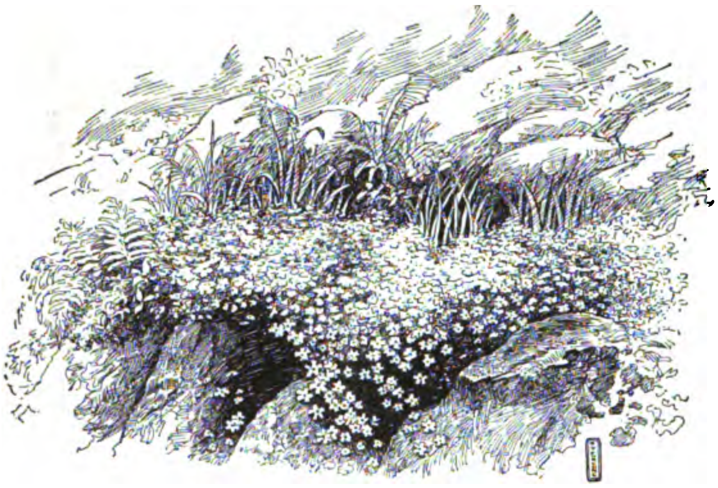
ROCK GARDENS. Figs. 2137–40. Nature in time will make a garden even on the unbroken surface of a rock, by clothing it with lichens, algæ and mosses of many exquisite forms having much variety and often striking brilliancy in coloring. If there are soil-filled cracks and pockets then ferns and flowering plants will find a place. At low elevations, however, these flowering rock-plants are comparatively few, for soil accumulates rapidly and strong-growing herbs, shrubs and trees, aided by favorable climatic conditions, soon cover the rock surface or furnish so dense a shade that only mosses, lichens and ferns will thrive.

The ideal rock or alpine gardens are within that region on mountain summits between the limits of tree growth and the edge of perpetual snow, and in the corresponding regions toward the poles, where the plants are protected from the rigors of a long winter by blankets of snow and are quickened into a short period of rapid growth by a comparatively low summer temperature. Here, where there are deep, cool, moist rock crevices and pockets filled with fragments of broken stone and porous decayed vegetable matter, are the favorable conditions wherein the real alpine plants can multiply their neat and dainty cushions, tufts and rosettes of dense and matted foliage and their abundance of exquisitely formed and brilliantly colored flowers. A successfully grown collection of these plants in contrast with ordinary garden flowers would be like a collection of cut gems as compared with one of rough minerals and rocks, for they have an exquisiteness of finish and depth of coloring that gives them as unique a place in the vegetable kingdom as they have in the plan of nature. Surely there are men and women who, if they knew these plants well, would be fired with an ambition to excel in their cultivation; and in so doing they may enter a comparatively untrodden path if they will limit their work chiefly to the alpines of this continent. They are represented in the New England mountain region by such species as *Arenaria Grœnlandica, Loiseleuria procumbens, Silene acaulis, Diapensia Lapponica, Arctostaphylos alpina, Vaccinium cæspitosum, Saxifraga rivularis, Veronica alpina, Geum radiatum*, var. *Peckii, Sibbaldia procumbens, Rhododendron Lapponicum, Bryanthus taxifolia, Primula farinosa, Saxifraga oppositifolia, Aizoon* and *aizoides, Aster polyphyllus* and *Woodsia glabella*; and in the Rocky Mountains and Pacific Coast Ranges by *Erigeron uniflorus, lanatus* and *ursinus, Actinella Brandegei* and *grandiflora, Artemisia borealis, scopulorum* and *alpina, Senecio Soldanella, Fremontii, petræus, uniflorus* and *werneriæfolius, Crepis nana, Campanula uniflora, Primula Parryi* and *suffruticosa, Androsace Chamæjasme* and *septentrionalis, Gentiana prostrata, frigida, Newberryi, Parryi* and *simplex, Phlox bryoides* and *cæspitosa, Polemonium confertum, Cassiope Mertensiana, Bryanthus Breweri, Draba streptocarpa, Parryi* and *nudicaulis, Arabis Lyallii* and *platysperma, Smelowskia calcycina, Lychnis montana* and *Kingii, Calandrinia pygmæa, Claytonia megarrhiza, Spraguea umbellata, Dryas octopetala, Geum Rossii, Saxifraga chrysantha* and *bryophora, Cysopteris alpina, Aplopappus pygmæus, Lyallii* and *acaulis, Omphalodes nana*, var. *aretioides, Chionophila Jamesii*, etc. (Not all of these names are accounted for in this work. They may be found in the Current Manuals of North American Plants.)

The uncultivated American plants in this class are quite as numerous and attractive as are the European species that have been long cultivated there. Here alpines have been but little cultivated. A very few easily grown European kinds, like *Aubrietia deltoidea, Achillea tomentosa, Campanula Carpatica* and *Arabis albida*, are offered by American nurserymen and cultivated in the open border. On a few private places small rock gardens have been established, or advantage has been taken of favorable local conditions to cultivate some additional species, and in one or more botanic gardens considerable collections have been at times maintained, chiefly in frames. Generally what have passed for rock gardens have been rockeries—mere piles of cobbles raised from the surface of turf or piled against dry banks in such a manner as rapidly to disperse instead of slowly conserve all soil moisture. Even the most self-assertive weed fails to thrive in such a garden. A little better than this was the rock garden at the World's Fair, in which was the alpine plant exhibit of the Royal Botanic Garden of Berlin, comprising 103 species, of which only 23 were alive in August.

2137. A rockery bordering a lawn.

In general, we have a smaller rainfall, less humidity and a larger proportion of sunny days than in England, to which we must look for the best instruction in the cultivation of alpine plants. This must be regarded in the arrangement of our rock gardens. Every precaution should be taken to secure the full advantage of rainfall and any natural water supply, and there should also be a liberal and constant artificial water supply. It must be kept in mind, too, that at low elevations the long, hot summers do not allow the period of rest that such plants require. This condition must be met by devices, methods and locations that will retard the growth in spring, check it at an early period in autumn, and keep the plants fully dormant in winter, such as shade, mulching, and, in the case of particularly difficult plants, the protection of frames. It is essential that conditions be provided that will enable the roots to extend for a long distance, often many feet, in narrow crevices and pockets between rocks to depths where there is a uniform temperature and uniform moisture supplied by moving water, for frequent freezing and thawing and stagnant water are fatal. These cavities should be filled with such loose material as fragments of rock mixed with decayed vegetable matter, without manure, and arranged to provide for the free passage of hair-like roots, for perfect drainage and the free access of air. To provide these unusual conditions on the average private place in a large way would be so difficult and so expensive that it is not to be recommended. A small collection comprising a few easily cultivated alpines and the similar rock plants referred to in a later paragraph may, however, be successfully grown on reconstructed stone walls, on ledges, in small rock gardens and in the open borders of almost any country or city place. Persons who desire to cultivate a large collection of true alpines should seek a situation where favorable natural or existing conditions can be taken advantage of. Such locations are likely to be found at the seashore and in rocky and hilly regions—such regions, for example, as are selected by many people for summer homes. A ledge, a natural mass of boulders or an abandoned quarry will often provide them. Pockets and crevices of ledges can be cleared of unsuitable material, and if they are not deep enough to hold moisture and have an equable temperature their depth may be increased by the judicious use of wedges, bars and explosives. Boulders can be arranged in such a manner as to secure suitable deep pockets and crevices of soil, springs can be diverted to supply a constant flow of water, underground pipes can be carried from an artificial source of supply to various points where conditions require them. However favorable the conditions are, it will be found that much can be done to advantage in different localities to meet the special requirements of different groups of plants. In such work, however, it should be kept constantly in mind that there are plants that will grow in all sorts of surroundings, and that it will often be much better to seek such as are adapted to existing conditions than to go to the expense of radically modifying such arrangements.


2138. A pocket in the rocks.

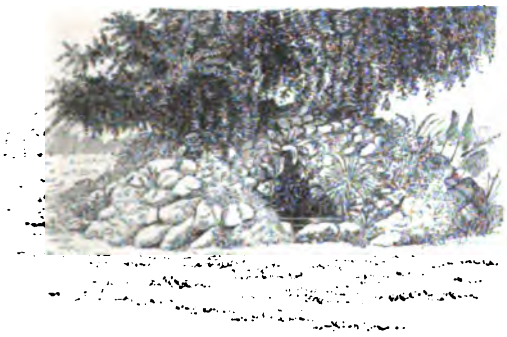
If an artificial rockery is to be constructed, it should be borne in mind that it is not for the purpose of displaying a collection of curious rocks fantastically arranged, but to provide a place for growing a class of plants that cannot be as well grown elsewhere. It would be better never to think of securing mountain, valley and rock effects in the disposition of the material to be used, but only to think of providing many varied conditions and situations as regards exposure to sun and shade, depth of pockets and crevices, the character and depth of soils, subterranean and surface water supply, and whether it be permanent or fluctuating. In selecting and arranging the rocks freshly broken raw faces should not be exposed, but rather such faces as are already covered with a growth of lichens for sunny places and with mosses for shady spots. To take full advantage of surface water, pockets and crevices should have a decidedly downward direction from the exposed surface and not be sheltered by overhanging rock. That this does not apply in all cases, those who are familiar with the habitats of rock-plants know full well. The natural habitat of *Pellæa gracilis* in the upper Mississippi bluffs is in horizontal crevices well back from the edge of the overhanging rock, where it is absolutely protected from all surface water. It finds sufficient moisture in the horizontal seams. *Pellæa atropurpurea* will grow in narrow cracks and small pockets on the face of dry limestone boulders where there can be no possible internal supply of moisture. These instances go to show that the general principles that will apply to such plants as a class will not apply to all species, and it simply gives emphasis to the importance of trying a plant under all sorts of conditions before assuming that it can not be grown. The writer remembers well an attempt to grow that most exquisite alpine flower, *Gentiana verna*, in the open border on a little pile of rocks to give it suitable drainage. It was transplanted a number of times to places where its environment appeared to be about the same, and finally a situation was secured, where, instead of barely holding its own, it increased and produced a number of its great deep blue flower-cups.

The importance of protection from drying and cold winds and of securing shade in many situations must not be overlooked. Sometimes advantage may be taken of an existing deciduous or evergreen tree or shrub growth, or rapid-growing varieties can be planted to make a screen. While shelters of this character are of value about the outer limits of a rock garden, they can hardly be used for separating its smaller compartments. For this purpose slow-growing, dense-foliaged evergreens with a restricted root range are best. This would include the Yuccas, a few of the dwarf forms of Thuya, Juniperus, Picea, Retinispora and practically all the broad-leaved evergreens. The latter, especially the Rhododendrons (of which *Rhododendron maximum* can be secured in large plants at low cost), are particularly useful owing to their habit of growth, restricted root area, and the facility with which they can be moved from place to place as desired. As these shelter-belts and groups form the background and setting of the rock garden and are the dominating landscape feature in views from a distance, their composition and disposition is a matter of much importance. The disposition must be governed, however, by the general arrangement of the grounds, but in this arrangement an agreeably varied sky-line and composition of plant forms and of shades of green should be sought for. In the composition of the background, and in the planting of the rock garden as well, a decided character should be given to the whole and to each distinct compartment by using some few effective plants in quantity rather than a great number of varieties in small quantities. Variegated and distorted garden freaks should be excluded, for they would only distract the attention from the rock garden, the primary object. Even more inappropriate are stationary fountains and vases.

For more specific instructions as to the construction of rock gardens and the care and propagation of rock-plants (for European conditions) see Robinson's "Alpine Flowers," London, 1875, and Sutherland's "Hardy Herbaceous and Alpine Flowers," Edinburgh and London, 1871.

Up to this point reference has been made for the most part to distinctly alpine plants; that is, plants that are confined exclusively to the region on mountains above the tree and shrub line. They are the ones that will test the skill of the cultivator. There are, however, many rock-plants; that is, plants that grow naturally on rocks, or plants having a tufted, matted and more or less persistent and evergreen foliage similar to alpines that can be used with them in less favorable positions in the rock garden or in the open border. Many of such plants can be readily procured from American nurserymen and collectors. They are easy of cultivation and attractive in habit and flower. The writer would include also low-growing bulbous plants, especially such as have inconspicuous foliage. They can be planted with the low ground-covering plants to push up through them. From this list are omitted such plants as belong more properly in the wild garden, especially such as spread rapidly by underground shoots and are likely to become a pest. (In a rockery conditions are such that it is almost impossible to extirpate deep-rooting, weedy plants, and they above all others should be rigidly excluded.) Among desirable rock-plants the writer would include *Geranium sanguineum*, *Andrewsii* and *Robertianum*, *Gypsophila muralis*, *Helianthemum vulgare*, *Helleborus niger*, *Leontopodium alpinum*, *Linaria Cymbalaria*, *Lotus corniculatus*, *Lychnis Viscaria*, *Papaver alpinum* and *nudicaule*, *Ceratostigma Larpentæ*, *Saponaria ocymoides*, *Veronica Teucrium* and *rupestris*, *Arabis alpina*, *Campanula fragilis*, *Daphne Cneorum*, species of Alyssum, Bellis, Cerastium, Arenaria, Draba, Epimedium, Iberis, Thymus, Arabis, Armeria, Ajuga, Dianthus, Sedum, Sagina, Primula, Aquilegia, Saxifraga, Corydalis, Myosotis, Sempervivum, Parnassia, Viola, Hepatica, Opuntia, Houstonia, *Anemone patens*, var. *Nuttalliana*, dwarf and creeping Campanulas, *Cornus Canadensis*, *Dicentra eximia*, *Calluna vulgaris*, *Iris cristata*, *verna* and *pumila*, *Leiophyllum buxifolium*, *Phlox subulata*, *amœna*, *reptans*, *Saxifraga Virginiensis*, *Silene Pensylvanica* and *Virginica*, *Anemone thalictroides*, *Waldsteinia fragarioides*, *Galax aphylla*, *Asperula odorata*, low-growing ferns, mosses, etc.

WARREN H. MANNING.



2139. An isolated rockery under a tree, Southern California.

2140. A picturesque rockwork, for the wilder parts of the grounds (European).

A rock garden or rockery is, or should be, an imitation (though of necessity in a limited and smaller way) of a natural rocky slope such as is often seen on mountain sides, but made more interesting and attractive by the planting of a large variety of alpine and other plants. The meaningless mounds of stones too often seen in gardens, planted with summer-bedding plants or vines, do not represent the true conception of a rockery. A rockery must of necessity often be artificial in the sense of made by man, because few gardens contain a natural bank or slope upon which one might be constructed. In any case, it should be characterized by simplicity and naturalness. In fact, in no part of a garden has the gardener more opportunity to give expression to his natural taste than in the construction and planting of a rockery. If a garden does contain a natural bank or slope, the position or aspect may not be an ideal one. A southern slope, unless within the shade of tall trees, is not as good an aspect as a northern one, owing to the soil becoming too hot and dry, just the opposite conditions for true alpine plants. Some of the best rockeries are what are known as underground rockeries; for instance, the one in the Royal Botanic Gardens, Kew, London, England, is an underground rockery. Before this rockery was constructed the ground was perfectly level. A cutting was begun at one entrance, at first shallow, but gradually deepening till a depth of some 6 or 7 feet was reached, and an average width of about 10 feet at the bottom. All the soil taken out was placed on the top of the slopes, thus still further increasing the height. The cutting was made in a winding manner, not formal or zigzag, but in such a manner that when completed, not only would a variety of aspects be secured to suit the requirements of different plants, but each turn should seem to possess a peculiar charm of its own. The whole cutting is perhaps some 200 yards in length. The rocks are placed in the banks in as natural a manner as it would seem possible to place them; now they stand out boldly, almost perpendicular with the edge of the path, then again they recede into hollow recesses. There are not too many rocks, nor yet too few. In one place a cascade falls over the rocks into a small pool which not only provides a habitat for aquatic and bog plants, but also adds greatly to the beauty of the rockery. For the convenience of the public a broad gravel path runs through the whole rockery. Rhododendrons and other shrubs are planted on top of the banks in groups, and not in straight lines, while behind these for protection and shade are planted pines and other conifers, as well as some deciduous trees. The rocks are placed in most cases so as to form "pockets" of good size into which the plants could be planted, and the soil made in the pocket to suit the requirements of the different plants. With such a variety of aspects and conditions this rockery is able to accommodate one of the largest collections of alpine and rock plants in the world. As this rockery was for a time the special charge of the writer while a student at Kew, well does he remember the deep carpets of mossy Saxifrage, Aubrietia, Arabis, Cerastium, Sedum, etc., which hung over projecting ledges of rocks, while in fissures and holes in the rocks were growing those dainty rosette-making saxifrages, *S. longifolia*, *S. Cotyledon*, *S. crustácea* and *S. caesia*, as well as the charming androsaces. In the deeper recesses of the rockery were to be found the large-leaved saxifrages, such as *S. crassifolia*, *S. ligulata*, *S. Stracheyi* and *S. purpurascens*. Quite at home and in suitable positions were alpine primulas, auriculas, and cyclamens. There were Iceland poppies, Himalayan poppies (*Meconopsis Wallichi* and *Nepalensis*), gentians from the tiny blue *Gentiana verna* to the tall *G. septemfida*, and many kinds of Funkia, Fritillaria, Erica, Epimedium, Cypripedium, Orchis, Lilium, Erythronium, Allium, Alyssum, Ajuga, Achillea, Armeria, Sagina, Sempervivum and creeping Veronica, besides other plants too numerous to mention. Particularly prominent positions, as on top of the rocks, or at a turning point in the path, were occupied by some stately plant, such as *Rheum palmatum*, *Acanthus mollis*, or *Gunnera manicata*, or *scabra*, while foxgloves, verbascums and such like plants would fill up the recesses in the shrubs on the top of the rockery. One end of the rockery beneath the shade of overhanging trees was devoted to hardy ferns, which grew with wonderful luxuriance. With the variety of rare and interesting plants, together with the artistic yet natural appearance of the whole rockery, a more beautiful place it would be difficult to conceive.

With these pleasant remembrances in mind the writer built a rockery in 1898, in the Botanic Gardens of Smith College, Northampton, Mass., somewhat after the pattern of the one at Kew, but at present on a very much more limited scale. The position chosen (the only one available) is near the outskirts of the garden proper, on what was formerly a grassy southern slope. A cutting was made through the slope in much the same manner as the one at Kew, but to secure good northern aspects the soil was all banked on the southern side. The path, which is quite level, varies in width from 3 to 6 feet. The height of the banks in which the rocks are placed ranges from 2 feet at the entrances to some 8 or 10 feet at the highest point. For rocks we used large, water-worn boulders collected in the vicinity. One shaded recess, with a northern aspect, is devoted to native ferns, which at the present time, 1901, number some 40 species. The whole rockery outside is banked with flowering shrubs, and on the southern bank outside are planted some trees, chiefly catalpas, for the purpose of shading the southern aspect of the rockery, as well as for ornament. Water is laid on so that the plants might not suffer in dry weather. The writer has not been successful with alpine primulas, mossy saxifrages, tufted gentians, and several other subjects which delight in a cool, moist climate, perhaps from his not having provided the ideal conditions for such plants, but more probably due to our extremes of climate. Still there is a large variety which does well here. The writer has found most of the low-growing veronicas, sedums, sempervivums, arabises, alyssums, achilleas, alsines, erysimums, aquilegias, campanulas, stellarias, pachysandras, the beautiful shrubby little *Daphne Cneorum*, and many others, do very well in the more sunny or southern aspects of the rockery, while on the northern aspects cerastiums, iberises, ajugas, Iceland poppies, rosette and large-leaved saxifrages, moss pinks, epimediums, herniarias, arenarias, cardamines, armerias, dianthuses, native orchises, cypripediums and many other plants do well. On the top of the rockery, to fill in recesses in the shrubbery, are planted foxgloves, verbascums and tall veronicas, while at conspicuous points are planted clumps of *Bocconia cordata*, *Telekia speciosa*, *Aruncus Sylvester*, or any herbaceous plant which looks well as an isolated specimen. In among the plants in irregular colonies are planted hardy bulbs, such as crocuses, scillas, ornithogalums, narcissi, snowdrops, chionodoxas, and grape hyacinths; these come up the first thing in the spring and blossom before the other plants get well started into growth, and are a decided acquisition to a rockery.

Almost all alpine plants may be readily propagated by seed, cuttings or division of the plants. The writer raises some from seed each year to fill up any vacancies in the spring. His plan is to sow the seeds in 4-inch pots early in February in a finely-prepared light soil, and place the pots in a moderately warm greenhouse; here they soon germinate, and as soon as large enough to handle they are transplanted either into other pots similarly prepared, or into small, shallow boxes. They grow vigorously through the early spring months, and by the first of May they may be planted out permanently. Seeds may also be sown in some shaded frame in spring and the plants transferred to the rockery in the fall. All the plants in the rockery should have a light covering of leaves or light strawy manure to protect them from excessive freezing and thawing during the winter, especially those planted on the southern exposure, or they may be protected with a few hemlock branches laid lightly over them. These should be removed as soon as the weather will permit in early spring. In planting a newly made rockery it is a mistake to plant too thick. Each plant should be allowed room to develop so as to show its true character, and the plant should then be limited in a measure to that space, especially if a much more rampant grower than its neighbors. As in other parts of the garden, weeds will insinuate themselves wherever they can gain a foothold. These must be removed as soon as they appear, and the whole rockery should be gone over at least once in ten days to keep each plant from encroaching on its neighbors, and to keep all in good order.

Edward J. Canning.

ROCKET. See *Hesperis*.

ROCKET CANDYTUFT. See *Iberis coronaria*.

ROCKET, YELLOW. *Barbarea vulgaris*.

ROCK ROSE. See *Cistus*; also *Helianthemum*.

ROCKY MOUNTAIN BEE PLANT. *Cleome integrifolia*.

RODGÈRSIA (Commodore Rodgers, U. S. Navy). *Saxifragàceæ*. A genus of one species, a hardy herbaceous perennial for which the following names have been proposed: Rodgers' Bronze Leaf, Bronze Leaf of Japan and Stately Five-Leaf. It grows 3–4 ft. high, and the leaves are finger-shaped, the 5 lobes being bold in outline, angled and serrate. In the spring the foliage is light green; in summer it assumes a metallic bronzy hue. The plant is a vigorous grower, and under favorable circumstances has been known to make a clump 9 ft. in diameter, the largest lvs. being a yard across and borne on stalks 3 ft. long. The fls. are borne in midsummer on stalks 4–5 ft. high. The general style of inflorescence is that of the popular Astilbe, to which it is closely allied. The fls. are very small, but make a feathery spray of fluffy white bloom. The panicle is a foot or more long and as wide at the base. Technically the fls. have no petals; what seem to be petals are the white calyx-segments. As a flowering plant it has been said by enthusiasts to be superior to Astilbe, but the bloom is scantier, rather greenish at first, and perhaps does not last as long. It may not be so amenable to forcing. Rodgersia is a native of the subalpine regions of Japan and is presumably hardy in our northern states. It is offered by importers of Japanese plants. The plant is highly esteemed by English connoisseurs, but seems to be nearly unknown to American gardens. Although any deep, rich garden soil will do, it is said to prefer a moist peaty soil. It should be placed in a sunny position, with plenty of room, where high winds cannot damage the foliage. Easily propagated.

Botanically Rodgersia is close to certain species of Astilbe, having 10 stamens and no petals; it differs in having connate carpels, scorpioid inflorescence and 5-cut rather than thrice ternate foliage. Other generic characters are: calyx-lobes 5: ovary 2–3-loculed; styles 2 or 3; stigmas capitate: ovules many.

podophýlla, Gray. Rhizome thick, scaly: radical lvs. 5-lobed; stem-lvs. 3-lobed: cymes scorpioid, forming a large panicle. B.M. 6691. G.C. II. 20:141. G.M. 33:477. Gn. 36, p. 171; 38, p. 125; 46, p. 434.

W. M.

RODRIGUÈZIA (Emanuel Rodriguez, Spanish botanist and apothecary). *Orchidàceæ*. A small genus of South American orchids, a few of which are cultivated for their graceful racemes of delicate flowers. The flowers are nearly always fragrant. The plants vary somewhat in habit. Some species form neat, compact tufts, while others, like *R. decora*, have long, straggling rhizomes difficult to keep within the limits of a block or a basket. Pseudobulbs small, compressed, 1–2-lvd. and bearing sheathing lvs. at the base: racemes erect or pendulous: dorsal sepal and petals similar, free, erect; lateral sepals united, concave, but scarcely saccate: labellum spurred or saccate, with a long claw parallel to the column, and a spreading blade usually exceeding the sepal: column slender. Robert Brown's genus Gomesa (sometimes written Gomeza), found on *G. recurva*, is now referred to Rodriguezia. *G. recurva* is *R. planifolia*.

Grow Rodriguezias in very shallow pots filled with tough peat, and well drained. Rest them in a temperature of 50°, giving little water. The growing temperature should be from 65–75°. Give plenty of moisture and shade from direct sunshine. The stronger-growing kinds will need thicker potting material in baskets; they do well wired on tree-fern stocks. During season of growth, syringing is necessary.

A. *Fls. large, white, spotted or rose.*
  B. *Raceme erect*......................1. **fragrans**
    2. **decora**
  BB. *Raceme pendulous*................3. **venusta**
    4. **candida**
    5. **pubescens**
AA. *Fls. small, deep rose or spotted red*..6. **secunda**
AAA. *Fls. greenish*......................7. **crispa**
    8. **planifolia**

fràgrans, Reichb. f. (*Burlingtònia fràgrans*, Lindl.). Lvs. tufted: racemes erect: fls. pure white, except the middle of the labellum, which is stained with yellow, very fragrant; lower sepals united, entire; dorsal sepal acute; labellum cucullate behind, with a 2-parted, pubescent appendage on the disk. April, May. Brazil. G.C. III. 4:757 (the plant is here figured with a pendulous raceme).

dècora, Reichb. f. (*Burlingtònia dècora*, Lem.). Plant with a long, slender rhizome, with oval, 1-lvd. pseudobulbs: scape nearly erect, 9 in. high, bearing 5–10 blossoms in a loose raceme: sepals and petals ovate, acute, connivent, white or pale rose spotted with red; labellum twice as long as the petals, white; middle lobe rounded, bifid, contracted into a broad claw which has several fringed lamellæ; column with falcate hairy ears. May, June. Brazil. B.M. 4834. F.S. 7:716.—Var. **picta**, Hort. (*Burlingtònia dècora*, var. *picta*, Hook.). Pseudobulbs orbicular, compressed: fls. short, acute; sepals and petals spotted with deep purple-red. B.M. 5419.

venùsta, Reichb. f. (*Burlingtònia venùsta*, Lindl.). Lvs. linear-oblong, forming compact masses: fls. in drooping racemes, large, white or tinged with pink and having a yellow stain on the lip; dorsal sepal acute, the lateral pair entire; labellum transversely plicate near the middle. Flowers at various seasons. Brazil. I.H. 5:188.—Very near *R. candida*.

cándida, Batem. (*Burlingtònia cándida*, Lindl.). Lvs. oblong, firm: racemes pendulous, 4–6-fld.: fls. white, with a light stain of yellow on the labellum, 2 in. long; dorsal sepal obovate, emarginate, the lower pair united into a concave, bifid blade, saccate at base; petals obovate, with the apex recurved; labellum with a broadly cuneate, bifid middle lobe, longer than the sepals and petals; base and lateral lobes parallel to the column, throat with many lamellæ. April, May. Guiana. B.R. 23:1927. F.M. 1871:548.

pubéscens, Reichb. f. (*Burlingtònia pubéscens*, Lindl.). Lvs. tufted, dark green, keeled: racemes many, pendulous, from the tuft of lvs.: fls. pure white; labellum 2-lobed, hastate; lateral lobes erect, furnished with lamellæ; column pubescent, in which it differs from the other species.

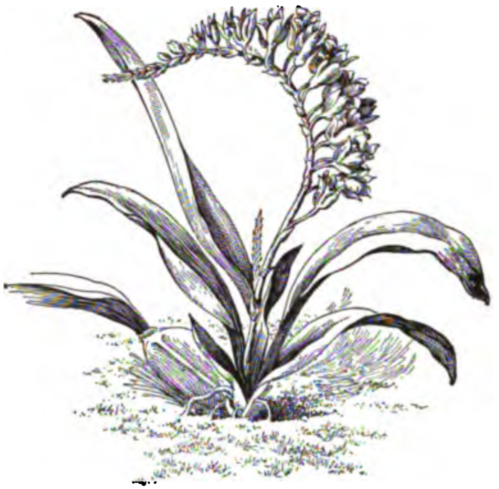
secúnda, HBK. Fig. 2141. Pseudobulbs bearing several thick, linear-oblong lvs.: raceme erect, secund, 6 in. high: fls. deep rose; sepals erect, ovate, convex, the lower pair keeled and gibbous; petals like the dorsal sepal; labellum obovate-oblong, emarginate, undulate, scarcely longer than the sepals. Aug. Trinidad, Guiana. B.M. 3524. B.R. 11:930. L.B.C. 7:676 (as *R. lanceolata*).

críspa, Lindl. Pseudobulbs elongate-ovate: lvs. oblong-lanceolate, spreading, undulate: raceme pendulous, rather dense: fls. green, with yellowish borders; sepals all free, undulate-crisp; petals similar; labellum lanceolate, sigmoid. Brazil. B.R. 26:54.

planifòlia, Lindl. Pseudobulbs clustered, compressed: lvs. lanceolate: raceme long, drooping: fls. greenish yellow, fragrant; sepals oblong, waved, acute, the lower pair united except at the end; petals like the dorsal sepal; labellum broadly oblong, acute, reflexed, shorter than the lower sepals. Feb. Brazil. B.M. 1748, 3504. L.B.C. 7:660 (as *Gomesa recurva*).

HEINRICH HASSELBRING and WM. MATHEWS.

ROGIÈRA. See *Rondeletia*.



2141. Rodriguezia secunda (× ⅙).

RÒHDEA (Mich. Rohde, physician and botanist of Bremen). *Liliàceæ*. A monotypic genus from Japan, essentially a tender foliage plant with luxuriant radical lvs. 1–2 ft. long. The fls. are borne among the lvs. in short, thick, dense spikes a few inches high; perianth globular-bell-shaped; anthers sessile; stigma peltate; style nearly wanting: fr. a globular, usually 1-seeded berry. Rohdeas are excellent plants for dwelling-house decoration, doing well in the cooler positions. They are perfectly hardy at Washington, the foliage being but slightly browned during the coldest weather.

Japónica, Roth. Root a long, nearly cylindric rootstock with fleshy fibers: lvs. typically green, 9–12 in a rosette, erect, oblanceolate: berry about the size of a small olive, with a red pulp. B.M. 898. Gn. 30, p. 541. —The following varieties, which differ in shape and color of the lvs., are offered by Dutch bulb growers: Vars. **aureo-striàta, falcàta, falcata var., latimaculàta macrophýlla, marginàta minor, pygmæa, zebrina.**

G. W. OLIVER and F. W. BARCLAY.

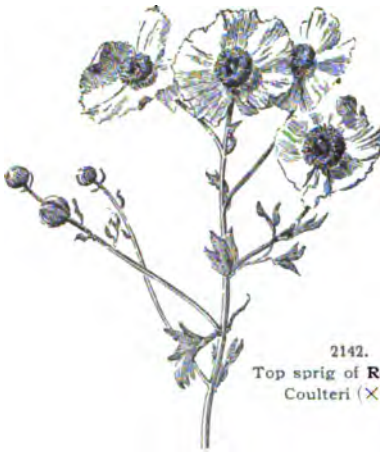
ROLLÍNIA (Charles Rollin, of Paris, 1661–1741, aided Tournefort). *Anonàceæ*. About 20 trees and shrubs of tropical America, differing from Anona in having the petals united into a 3–6-lobed tube, the exterior lobes wing-appendaged, the interior small or none: fr. sometimes of separate carpels: fls. 1–5 on peduncles that are terminal or opposite the lvs. The general remarks under Anona will apply to these plants.

Sièberi, A. DC. (*Anòna muscòsa*, Jacq.). Low tree, the young growth nearly or quite smooth: lvs. oblong, taper-pointed, smooth: exterior petals oblong and blunt (½–1 in. long), greenish, the interior smaller but prominent, reddish: fr. about 4 in. in diameter, greenish, somewhat globose, the surface bearing tubercles. Native in the islands of Guadeloupe and Martinique, and in Guiana; probably in various West Indies islands.—Introduced into southern Florida as a fruit plant, but it is yet very little known within our limits. L. H. B.

ROMNÈYA (after the astronomer T. Romney Robinson, friend of T. Coulter, who discovered it about 1845). *Papaveràceæ.* The CALIFORNIA TREE POPPY (Fig. 2142) is a somewhat shrubby plant with splendid 6-petaled white fls. measuring 6 in. or more across. Botanically, the genus is unique, having only one species and being distinguished from the other members of the poppy family by the fact that the numerous stigmas are connate at the base into a little ring, and are divergent at the apex. It is one of the few long-known plants that has acquired no synonym. Generic characters: sepals 3, with a broad, membranous, dorsal wing; petals 6, all alike; stamens very numerous, free; filaments filiform but thickened above; stigmas free: capsule 7–11-loculed, dehiscing to the middle, the valves separating by their margins from the firm persistent placentas.

Coùlteri, Harv. CALIFORNIA TREE POPPY. MATILIJA POPPY. Lvs. glaucous, 3–5 in. long, pinnately cut: petals broadly obovate: seeds black, a line or less long. Gn. 13:129; 26:465; 29, pp. 207, 211; 46, p. 405; 55, p. 208; 56, p. 239; 57, p. 263. G.F. 10:353. F.M. 1877:252. A.F. 5:397. A.G. 19:314 (sup. Apr. 16, 1898). —Ever since 1889 and 1890, when it was one of the leading novelties, the California Tree Poppy has been a much-talked-of plant, owing to its extraordinary beauty and the difficulties of cultivation. It has the largest flowers of any member of the poppy family, except possibly *Papaver orientale.* Though not considered hardy in the eastern states, it has been successfully grown in the open in northern New Jersey.

Romneya grows wild in California from San Diego to Santa Barbara county; also in Mexico. In the wild it blooms chiefly during June and July, but in cultivation from May to August. It is one of the characteristic features of California floriculture. Ernest Braunton writes from Los Angeles: "It should be grown here on dry, rocky soil; it will positively not grow in a wet or heavy soil. It needs no water here except the winter rains. It is very hard to grow either from seed or divisions."
W. M.



2142. Top sprig of Romneya Coulteri (× ⅛).

Romneya is difficult to transplant, due to the scarcity of fibrous roots; in middle California we transplant suckers (which are produced in great abundance) without any loss, provided a good, firm ball of earth is kept around the stout, thick roots in transit, and if the stems are cut well back, almost to the base. At San Francisco it grows luxuriantly in a heavy adobe soil, producing immense flowers. The name Matilija Poppy (pronounced Ma-til'li-ha) is the favorite in California. It comes from the Matilija canyon, Ventura county, where the plant grows in particular abundance. Miss Parsons writes: "Many people have the mistaken idea that it grows only in that region. It is not common by any means; but it is found in scattered localities from Santa Barbara southward into Mexico. It is very abundant near Riverside, and also upon the southern boundary and below in Lower California, where the plants cover large areas. It not only grows in fertile valleys, but seeks the seclusion of remote canyons, and nothing more magnificent could be imagined than a steep canyon-side covered with the great bushy plants, thickly covered with the enormous white fls." The blossoms remain open for many days.
J. BURTT DAVY.

The Romneya can be transplanted safely if cut to the ground before lifting and the transplanting is done during its dormant season and soon before growth commences. The writer has transplanted it—and that without cutting it all back—twice a year; in fall into a cold pit, and in April back from the pit to the bed in the garden, and with perfect success. There is no difficulty in growing it from seed; any careful person can do it. Get fresh seed,—that is the only secret, and this is imperative in all papaveraceous plants. But under artificial conditions in localities where the Romneya is not hardy, it requires a few years between the germination of the seeds and the blooming of the seedlings; hence the people will not bother with raising it in this way.
WILLIAM FALCONER.

ROMULÈA (*Romulus,* fabled as one of the founders of Rome). *Iridàceæ.* A genus of about 33 species of crocus-like bulbs from the Mediterranean region of Europe, the Cape and tropical Africa. They are small and slender plants with fls. an inch or so across, varying from crimson and purple through rose and lilac to white and also yellow. They are closely allied to Crocus, but differ in being less hardy, and in having a long peduncle and short flower-tube. Generic characters: lvs. linear, radical, with a few similar but smaller ones on the scape: fls. solitary in a spathe, on a simple or branching peduncle; perianth-segments oblong, much exceeding the short tube; spathe valves herbaceous. These bulbs seem to be unknown to the American trade.

A. *Fls. rosy or crimson.*

ròsea, Eckl. (*Tricnonèma ròsea,* Ker.). Corm globose, ⅛–½ in. thick: lvs. ½–1 ft. long, setaceous: peduncle 1–6 in. long, 1–3-fld.: outer spathe ¾ in. long: perianth with a short funnel-shaped tube with a yellow throat and a red-lilac limb, about 1 in. long, the outer segments with 3 faint purple stripes outside. S. Africa. B.M. 1225 (as *T. roseum*). F.S. 8:799 (as *R. Celsii*). Var. **speciòsa,** Baker (*T. speciòsum,* Ker.), has a larger perianth and outer segments, with 3–5 dark purple stripes of which the outer are feathered. B.M. 1476.

A. *Fls. yellow or white.*

Clusiàna, Baker (*Triconèma Clusiàna,* Lange). Fls. bright yellow, tipped with lilac. Spain. A white var. has been int. by Barr, of England.
F. W. BARCLAY.

RONDELÈTIA (Rondelet, 1507–1566, physician and naturalist of Montpellier, France). *Rubiàceæ.* About 60 species of tropical American shrubs and trees, with small 5- or 4-lobed, salver-shaped fls. of red, yellow or white, generally borne in showy terminal corymbs. The whole family is noted as furnishing numerous desirable stove plants, and Rondeletia is a highly esteemed genus. The following species are shrubs growing 4 ft. or more high. The flowers are generally fragrant, and the clusters 4 in. or more across. In the favorite species (*R. odorata*) the flowers number 10–30 in a cluster, each flower being fully an inch across; in the other species the flowers may number 150–200 to a cluster, each flower being less than ½ in. across. Known also as *Rogiera.*

Generic characters: calyx-lobes short or long, equal: corolla-tube usually slender, swelled or not, throat glabrous or bearded, mouth with or without a ring; limb 5-lobed (in some species 4-lobed); stamens inserted in the throat, included: ovary 2-loculed: capsule loculicidal.

R. anomala is the only species described below that does not have opposite lvs. *R. cordata* is often said to have a 4-lobed flower, a mistake that dates back half a century to a typographical error.
W. M.

Rondeletia anomala is a half-shrubby plant, stooling out when given root-room, but when confined to a pot it makes a compact mass of shoots, about two feet high, which bloom in the winter time, in terminal, flat-topped clusters of rosy purple flowers. It is not profuse at any time, but continues in bloom for two or three months. An additional good feature is handsome foliage, so that it is always presentable. Cuttings root easily at any time, and these may be grown in pots for a season. Barring the tendency to stooling, they do well planted out. Sandy loam and leaf-soil is the best compost, and a warm greenhouse, with sunshine, furnishes the best conditions. T. D. HATFIELD.

A. *Fls. red.*

B. *Lvs. opposite.*

odoràta, Jacq. (*Rondelètia speciòsa*, Lodd.). Lvs. ovate, nearly sessile: clusters 10–30-fld.: fls. crimson to brick-red, with a conspicuous yellow throat; lobes elliptical to roundish. Cuba. Mex. B. 2:53. B.M. 3953. B.R. 22:1905. F.C. 1:36. L.B.C. 19:1893. P.M. 2:242; 16:354. R.H. 1891:522 (throat not conspicuously yellow).

2143. Rondeletia cordata (X ⅓).

BB. *Leaves in 3's.*

anómala, Hort. Figured in J.H. III. 35:251 with 8 fls. in a cluster, the fls. ¾ in. across, with roundish lobes. The color is said to be coral-red or deep scarlet and the throat is presumably yellow. Habitat (?). Imperfectly known.

AA. *Fls. pink to white.*

B. *Base of lvs. more or less cordate.*

cordàta, Benth. (*R. cordàta*, Planch. *R. thyrsiflòra*, Hort., not Roth.). Fig. 2143. Lvs. ovate, acuminate, cordate; generally said to have pink or flesh-colored fls. with a yellow throat (as in F.S. 8:754, page 13), but in R.H. 1878:230 they are shown as pure white. Guatemala. Franceschi says it is native to Mexico.

BB. *Base of lvs. not cordate.*

C. *Corolla-lobes ovate: stipules broadly ovate.*

amœna, Hemsl. (*R. amœna*, Planch.). Lvs. elliptic, broader than in *R. gratissima*, and shorter acuminate, 2–5 in. long: fls. rose-pink, with a conspicuous yellow throat. Guatemala. F.S. 5:442. See also *R. versicolor* in supplementary list.

CC. *Corolla-lobes obcordate: stipules subulate.*

gratissima, Hemsl. (*R. gratissima*, Linden). Lvs. oblong-elliptic, 1–2 in. long, short-petioled, mostly rounded at the base: fls. with a bright rosy tube, the lobes fading from pale rose to whitish; throat not conspicuously yellow. Trop. Amer. I.H. 28:424. F.S. 15:1570 (corolla-lobes often obovate; stipules narrowly ovate). Gt. 490 (as *R. elegantissima*).

The following species would probably be desirable additions, as they represent other colors than the above: *R. Americàna*, Linn. White-fld. West Indies and S. Amer.—*R. Báckhousii*, Hook., a pink-fld. species from trop. Amer., is easily distinguished from those mentioned above by the much longer calyx-lobes, which are pink. B.M. 6290.—*R. Pùrdiei*, Hook., a beautiful pale yellow-fld. species from Colombia, has a great pyramidal cluster 5 in. across and 4 in. deep, with an astonishing number of fls., perhaps 150–200 in B.M. 5669.—*R. versicolor*, Hook., is referred to R. amœna by Index Kewensis but seems distinct. The fls. are said to be "remarkable for their play of colors; the tube is yellow; the limb in bud deep rose-color, changing when they expand to pale rose and then to white, with a yellow disk, and having a two-lobed green spot in the center from the color of the stigmas, which protrude a little beyond the mouth." B.M. 4579. W. M.

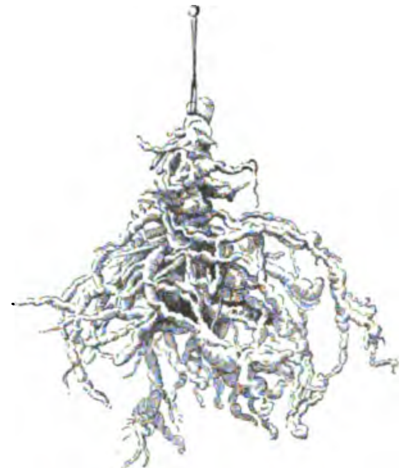
ROOT CELLARS. See *Storage*.

ROOT-GALLS. Abnormal enlargements often appear on the roots of plants. These enlargements are much more frequent than is generally supposed, but from their position under ground are rarely observed. From an economic standpoint they have not received the attention that they merit.

Although the term root-gall is usually applied to the abnormal enlargement of roots due to insects and other animal organisms, it has a much wider application as used by most plant-growers. The presence of nodules or local enlargements on the roots of plants has been discussed by different authors under the names root-galls, root-knots, root-swellings, etc. In cases in which the cause of the nodules of hypertrophied tissue is known, special names have been assigned to the enlargements. Thus the gall formed by the eel-worm (*Heterodèra radicicola*) is known as the nematode root-gall (Fig. 2144); the enlargement on the roots of cabbage and related plants by the myxomycete (*Plasmodiophora Brassicæ*) is called club-root; the swellings on the roots of the peach, apricot and many other plants, which are of characteristic appearance and usually appear at the crown of the plant, are known as crown-gall. Root tubercles are small gall-like bodies found on the roots of many leguminous plants. They are symbionic in nature, the organism causing them being helpful to the plant. See *Legumes*.

Abnormal root enlargements are due to the following causes: (1) animal parasites, as in the nematode root-gall (Fig. 2144), the galls formed on the roots of the grape by the phylloxera, and the galls frequently observed on the roots of our indigenous ceanothi; (2) vegetable parasites, as in the club-root and the crown-gall (Fig. 2145); (3) mechanical injury, causing excessive callous development, root-burls, etc.

In addition to the above, the causes of these enlargements are oftentimes obscure or unknown. The form of crown-gall on the apple, blackberry and a large number of other plants is as yet unknown so far as cause is concerned. It may be caused by a similar organism as that causing the crown-gall on the peach

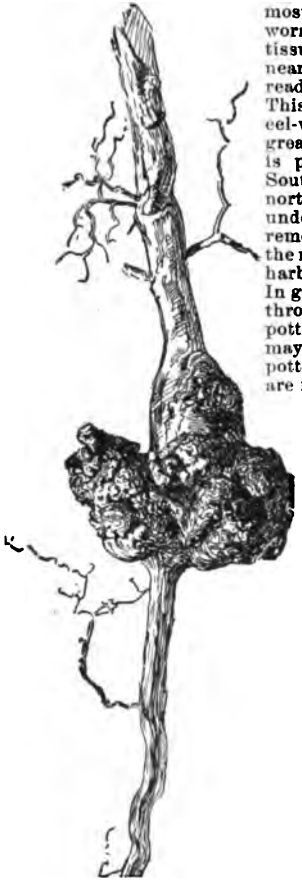


2144. Root-galls due to nematodes—Tomato roots.

and apricot in the Southwest, but as yet it remains to be investigated.

Swellings on the roots of the mulberry are said to be due to the hypertrophy of the lenticels. Some investigators have attributed gall-like root-growths in some instances to the hypertrophy of adventitious buds.

The root-galls caused by the nematode (*Heterodera radicicola*) may usually be readily recognized from other forms of hypertrophied tissue by the numerous knotty enlargements on the smaller roots infested by the worms. By careful search, in most instances, the distended female worms may be found in the infested tissue, where they appear as small, nearly spherical, pearl-like bodies, readily seen with the unaided eye. This minute worm, commonly called eel-worm, feeds upon the roots of a great variety of cultivated plants and is particularly destructive in the South. It is only injurious in the northern states to plants growing under glass. The most effective remedy in the case of field crops is the removal of all rubbish that would harbor the worms during the winter. In greenhouses steam can be forced through the infested soil. When potted plants are badly affected they may be severely root-pruned and re-potted in soil free from worms. They are not troublesome in soil that has been frozen since an infested crop was grown in it.



2145. A Root-gall.

The root-swellings caused by the grape-vine gall-louse (*Phylloxera vastatrix*) may be readily recognized from other root-galls by the presence of the insects. The young insects, by puncturing the epidermis of the roots and sucking the sap, cause the galls to develop. The insect is found on the diseased roots in all stages of development during the summer.

The most effective method of holding the insect in check appears to be in the use of resistant roots, i. e., the grafting of the more tender varieties on roots of those that are stronger and better able to resist the attack of the insect. Bisulfide of carbon in some instances has proved effective in killing the lice.

The crown-gall appears to be the most harmful of root diseases affecting cultivated plants in this country. These galls have been reported upon the roots of the peach, apricot, almond, prune, plum, apple, pear, walnut, grape, raspberry, blackberry, cherry, poplar and chestnut, and without doubt further investigation will find it upon other plants as well.

As yet it is not known whether the crown-gall as at present known always arises from the same cause, as the galls vary considerably on different plants and the cause has been definitely ascertained only in a few instances. The fleshy outgrowths so abundant in the Southwest on the roots of the peach, apricot and allied plants, known under the name of crown-gall, are caused by a slime-fungus (*Dendrophagus globosus*), which is parasitic in the infested roots.

Seedlings from one to six months old appear to be most susceptible to this disease, hence it is particularly destructive to nursery stock. When the galls appear on young trees they almost always occur on the side of the main root a few inches below the surface of the soil, or in the region of the crown. With more mature trees they are likely to occur at greater depth on lateral roots. At first the gall has a uniform outer appearance, but later it becomes warty from unequal growth. The tissue of the developing gall is soft and succulent, with nodules of woody tissue scattered through it. The galls vary much in size and may reach a diameter of ten inches.

But little is known as to remedies for crown-gall. As the disease is primarily a nursery disease, the most effective remedy is in securing stock for planting from a non-infested nursery. The disease can be held in check to some extent in infested orchards by cutting off the galls that appear on the tree boles at the surface of the soil and applying to the wounds a paste made from bluestone and lime. J. W. Toumey.

ROQUETTE or ROCKET-SALAD (*Erùca sativa*, Mill.), a low-growing hardy annual from southern Europe, whose leaves resemble those of radish and turnip, is much used by the French as a spring and autumn salad and pot-herb. The flavor of the young, tender leaves, which are the parts used, bears a strong resemblance to that of horse-radish. In America it is but little grown.

The first sowing may be made in early spring, the seed being dropped thinly in shallow drills a foot apart, with successional plantings each second or third week through the season. The soil must be rich and well supplied with moisture, else the leaves will probably be tough and acrid. Inter-culture is the same as for spinach, lettuce and similar crops. Frequent watering and tillage in hot, dry weather to insure rapid, vigorous growth should result in succulent, mild-flavored leaves. In summer the plants run rapidly to seed; in spring and autumn they will produce abundantly after being cut. The pale citron-yellow flowers emit a perfume resembling that of orange blossoms. M. G. Kains.

RÒSA (ancient Latin name). *Rosàceæ*. Rose. Ornamental deciduous shrubs, upright or climbing or creeping, usually with prickly stems, alternate, stipulate, odd-pinnate, rarely simple leaves, showy purplish, carmine, pink or white flowers, and conspicuous, often ornamental, usually scarlet fruits. There is probably no flower more popular and better known than the Rose. From time immemorial poets have sung its praise, and the love of it can be traced through the most ancient documents in the literature of the Aryan race. It is remarkable to note, however, that the Rose has played a far inferior part in the horticulture of the Chinese and Japanese. It is probably the first flower known and cultivated in a double state, and it is the double-flowered Garden form whose image the word "Rose" almost invariably brings to our mind, while to the wild single-flowered Roses much less attention has been given. The ornamental value of single Roses is rarely fully appreciated. The Wild Roses have a simple charm and graceful beauty of their own. No doubt the bold and dominating beauty of the double Roses has eclipsed the more modest attractions of the single Roses. The longer blooming season of the Garden Roses is also a factor in their favor. Though the Wild Roses cannot, perhaps, be compared with their more noble sisters of the garden, they are nevertheless fully able to rival other ornamental shrubs for the adornment of park and plot. According to the habit peculiar to each species, they can be used for a variety of purposes. Most of the species are shrubby, rarely exceeding 6 or 8 ft., and may be used for borders of shrubberies or for covering slopes and rocky ridges, especially *R. rugosa*, *R. humilis* and various American species. Some kinds, like *R. rugosa* and *R. lucida*, make handsome ornamental hedges. The climbing species are used for covering walls, trelliswork, arbors, porches or pillars, but perhaps display their beauty to the most advantage when allowed to ramble over shrubs or rocks. The half-evergreen *R. Wichuraiana* makes a beautiful ground-cover and may also be used for edging groups and flower beds.

The fruits of most species are decorative and often remain on the branches all winter. The red stems of most of the species of the Carolinæ and Cinnamomeæ groups are effective in winter also. The foliage of most of the American species turns purple-orange or yellow in autumn, and so does that of *R. rugosa*, which is in

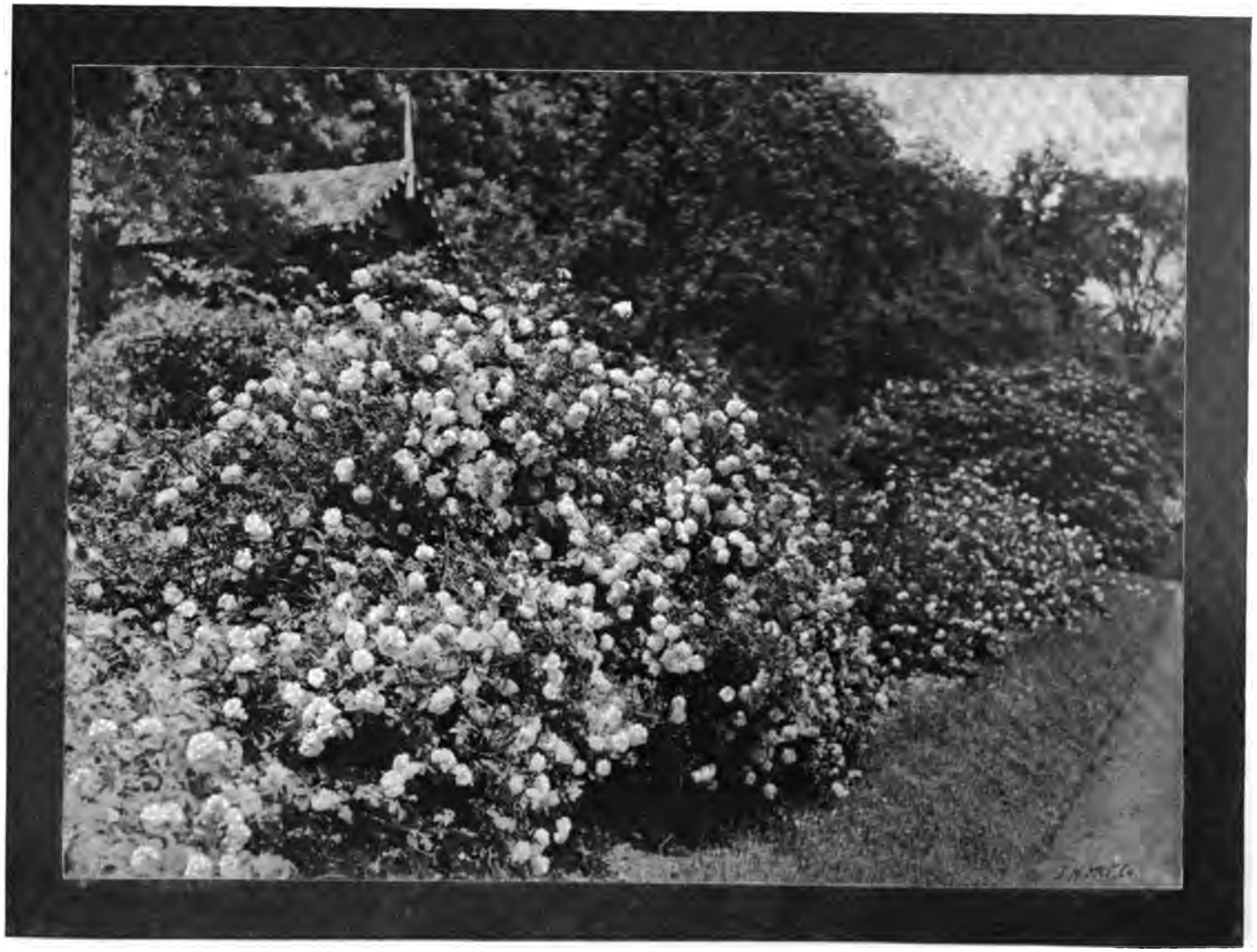


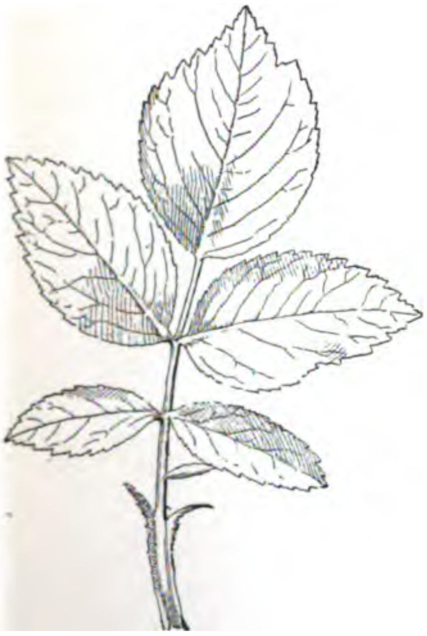
Plate XXXIV. A Rose Garden Madam Plantier. one of the standard white garden roses.

regard to the foliage the handsomest of the hardy Roses, with its dark green leathery and glossy leaves.

Most of the species are hardy or almost hardy north, as *R. rugosa, setigera, Carolina, Virginiana, lucida, humilis, canina, rubiginosa, spinosissima, alpina, arvensis* and *multiflora*. Some species, as *R. Wichuraiana, sempervirens, sericea, microphylla, Chinensis* and *Eglanteria*, require protection north. Others, as *R. Banksia, bracteata, lævigata* and *gigantea*, are hardy only south.

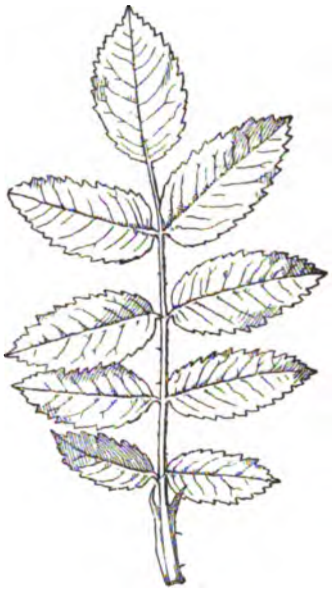
With few exceptions the Roses are of easy cultivation and grow in almost any kind of soil, except in a loose and very sandy one. They are readily transplanted. The Wild Roses need little pruning; they should only be thinned out and the weak and old wood be removed; long and vigorous shoots should not be shortened, especially in the climbing varieties, as these shoots are the most floriferous.

All true species can be propagated by seeds. The hips should be gathered as soon as ripe, the seeds washed out and sown at once or stratified and sown in spring. They germinate the first year, but if kept in the hips during the winter and allowed to become dry, they usually do not germinate until the second year. Mice are very fond of the seeds. Almost all species grow readily from cuttings of nearly ripened wood in summer under glass. Many species, especially the climbing Roses, can be propagated by hardwood cuttings taken in fall and planted in spring. Layering is less often practiced, except with a few species, like *R. lutea* and *R. hemisphærica*, which do not grow readily from cuttings. Some species, especially those of the groups of Cinnamomeæ, Carolinæ and Gallicæ, can be increased by root-cuttings; the roots are taken up in fall, stored during the winter in sphagnum or sand in a frost-proof room, and sown in spring in drills and covered about 2 inches deep. The species of the last-named groups and some others are also often increased by suckers and division. Budding and grafting is less often done with the Wild Roses and should be avoided for Roses in shrubberies where the individual plants cannot be carefully watched; the stock usually throws up suckers and outgrows the cion, often in a short time.



2146. A 5-foliolate Rose leaf.

Rosa is a widespread genus, easily distinguished by well-marked characters from allied genera, but in the limits of the genus itself the characters are exceedingly variable and it is very difficult to group into sections and species the innumerable forms which often pass gradually into each other. In no other genus, perhaps, are the opinions of botanists so much at variance in regard to the number of species. While some, as Bentham and Hooker, estimate the number at about 30, the French botanist Gandoger actually describes from Europe and western Asia alone 4,266 species. The majority of botanists recognize over 100 species. The Roses are almost equally distributed through the colder and temperate regions of the northern hemisphere, in America extending to North Mexico, in Africa to Abyssinia, and in Asia to India. They are all shrubs of upright habit, or climbing or sarmentose, with usually prickly stems: lvs. stipulate, alternate, odd-pinnate, with 3 to many lfts. (Figs. 2146, 2147), rarely simple: the fls. are mostly large and showy, pink, purple, white or yellow, and appear usually solitary or corymbose at the end of short branchlets; petals and sepals 5, rarely 4; stamens numerous; pistils numerous, rarely few, inclosed in an urn-shaped receptacle, which becomes fleshy and berry-like at maturity, containing several or many bony akenes, usually erroneously called seeds; the fr. itself is called a "hip." Fig. 2148, 2149. The fls. show a remarkable tendency to become double, and such forms have been known and cultivated from time immemorial. These innumerable garden forms, increasing every year, are almost exclusively of hybrid origin and are therefore omitted in the botanical classification of the genus.



2147. A 9-foliolate Rose leaf.

Many attempts have been made to subdivide the genus with more or less satisfactory results; the more important are those by A. DeCandolle, Lindley, Regel and Baker. Nowadays the arrangement proposed by Crépin is considered the most natural and satisfactory and has been followed in the account given below. No good general monograph has been published since Lindley's Monographia Rosarum (1820), except a rather short one by Regel in 1877. Of the more recent publications the most important are those of Crépin, especially his "Primitiæ Monographiæ Rosarum." In consulting his publications one has to bear in mind that the author changed his opinion somewhat respecting the value of the species during his studies of the genus. In his later publications he takes a broader view in regard to the specific value of the Rose forms and unites under one species many forms which he formerly considered as distinct species. An illustrated monograph valuable for the knowledge of the older garden forms and species is Thory and Redouté's "Les

Roses," with 160 colored plates (1817-1820). It is quoted below as Red. Ros. As the first edition in folio is found in only very few libraries, the smaller edition is cited in parenthesis by volume, groups and the sequence of the plates, neither pages nor plates being numbered continuously in this edition.

The economic properties of the Rose are of little importance. The most valuable product is attar of Roses, a highly fragrant essential oil. It is chiefly manufactured in southeast Europe and western Asia from *Rosa alba* and *R. Damascena*, and of late this industry has been successfully transplanted to Germany. See *Perfumery Gardening*, Vol. III. The fruits of some species, especially of *R. villosa* and *R. canina*, are made into preserves.

For general notes on culture, see *Rose*.

INDEX.

Abyssinica, 8.
acicularis, 40.
Agatha, 16.
alba, 18, 41.
alba-plena, 14, 41.
alpina, 36.
Altaica, 42.
Andreæ, 41.
Arkansana, 39.
arvensis, 7.
Austriaca, 16.
Banksiæ, 14.
Bengalensis, 11.
berberifolia, 1.
bicolor, 43.
bifera, 17.
blanda, 38, 39.
blanda setigera, 39.
Borbonica, 13.
Bourgeauiana, 40.
Boursaulti, 37.
bracteata, 5, 48.
Brunoni. 8.
Burgundiaca, 16.
calendarum, 17.
Californica, 83.
calocarpa, 41.
Camellia, 49.
canina, 22.
capreolata, 7.
carnea, 2.
Carolina, 24.
centifolia, 16.
Cherokensis, 49.
Chinensis, 11.
cinnamomea, 35.
corymbosa, 24.
cristata, 16.
Damascena, 17.
Dawsoniana, 2.
Devoniensis, 11.
Dijonensis, 16.
Eglanteria, 21, 43.
Engelmanni, 40.
Fendleri, 31.
ferox, 41 and suppl.
ferruginea, 23.
florida, 2.
fœcundissima, 35.
foliolosa, 28.
Fortuneana, 15.
fragrans, 11.
Francofurtana, 19.
fraxinifolia, 38.
Gallica, 16.
gigantea, 10.
glaucophylla, 44.
grandiflora, 42.
gymnocarpa, 29.
Hardii, 1.
Harisoni, 44.
hemisphærica, 44.
Hibernica, 42.
hispida, 34, 42.
humilis, 25, 26.
incarnata, 16.
Indica, 11 and suppl.
inermis, 42.
intermedia, 2.
Iwara, 2.
Kamschatica, 41.
lævigata, 49.
Lawrenciana, 11.
Leschenaultii, 8.
longifolia, 11.
Luciæ, 5 and suppl.
lucida, 25.
lutea, 43.
lutea-plena, 14.
lutescens, 42.
Lyoni, 26.
Macartnea, 48.
macrantha, 16.
Manetti, 11.
microphylla, 50.
minima, 11.
minutifolia, 46.
mitissima, 42.
mollis, 20.
mollissima, 20.
moschata, 8.
multiflora, 2.
muscosa, 16.
myriacantha, 42.
Nipponensis, 40.
nitida, 27.
Noisettiana, 12.
Nutkana, 34.
Nuttalliana, 24.
odoratissima, 11.
officinalis, 16.
palustris, 24.
parviflora, 26.
parvifolia, 16.
pendulina, 36.
Pennsylvanica, 24.
Persica, 1.
pimpinellifolia, 42.
pisocarpa, 30.
Pissardii, 8.
platyphylla, 2.
polyantha, 2, 11.
pomifera, 20.
pomponia, 16.
pratincola, 39.
prostrata, 6.
provincialis, 16.
pulchella, 16.
pumila, 11 and 16.
punicea, 43.
Pyrenaica, 36.
Rapa, 25.
Rapini, 44.
reclinata, 37.
Regeliana, 41.
repens, 7.
reversa, 42.
rosea, 41.
rubella, 42.
rubiginosa, 21.
rubifolia, 4.
rubra, 5, 41.
rubra-plena, 41.
rubrifolia, 23.
rugosa, 41.
Sayi, 40.
scandens, 6.
semperflorens, 11
sempervirens, 6.
sericea, 45.
setigera, 4 and 39.
silvestris, 7.
simplicifolia, 1.
Sinica, 49.
spinosissima, 42.
stellata, 47.
stylosa, 9.
sulphurea, 44.
ternata, 49.
tetrapetala, 45.
Thunbergiana, 2, 41.
tomentosa, 4.
trigintipetala, 17.
turbinata, 19.
villosa, 20, 26.
Virginiana, 38.
viridiflora, 11.
vulgaris, 11.
Watsoniana, 3.
Wichuræ, 2.
Wichuraiana, 5.
Woodsii, 32.

KEY TO THE GROUPS.

(For a horticultural classification of Roses, founded primarily on garden values, see the article *Rose*.)

A. *Lvs. simple, without stipules: fls. yellow* ...
Subgenus Hulthemia (Species No. 1)

AA. *Lvs. pinnate, stipulate*......................
Subgenus Eurosa (Species Nos. 2–50)

B. *Styles exserted beyond the mouth of the receptacle.*

C. *Exserted styles connate into a column.* (See Fig. 2150 right.)

Climbing or creeping: style about as long as stamens....Section I. Systylæ (Species Nos. 2–8)

Upright, with arching branches: styles shorter than stamens........................... ....
Section II. Stylosæ (Species No. 9)

CC. *Exserted styles free.*

Lfts. usually 3–5: petals 5 or more ....
Section III. Indicæ (Species Nos. 10–13)

Lfts. usually 7–9, small: petals usually 4, white..
Section XI. Sericeæ (Species No. 45)

BB. *Styles reaching only the mouth of the receptacle and stigmas forming a sessile head over it* (see Fig. 2150).

C. *Stipules free or almost free: sarmentose or climbing shrubs: fls. white or yellow.*

D. *Branches glabrous: lfts. 3–5, stipules small, entire.*

Fls. small, umbellate, yellow or white: pedicels and receptacle smooth ....
Section IV. Banksiæ (Species Nos. 14, 15)

Fls. large, solitary, white: pedicels and receptacle prickly ....
Section XIV. Lævigatæ (Species No. 49)

DD. *Branches tomentose or pubescent: lfts. 7–9; stipules pectinate: fls. 1 or few, white, with large bracts at the base of the short pedicel: receptacle tomentose* ....
Section XIII. Bracteatæ (Species No. 48)

CC. *Stipules adnate.*

D. *Lvs. of flowering branchlets 3–5-foliolate, large and firm: stems usually with prickles and bristles: fls. upright, on long pedicels: receptacle bristly: sepals reflexed after flowering, caducous* ....
Section V. Gallicæ (Species Nos. 16–19)

DD. *Lvs. of flowering branchlets 5–9-foliolate (rarely 3-foliolate, the fls. then short-pedicelled, with smooth receptacle).* See DDD, next page.

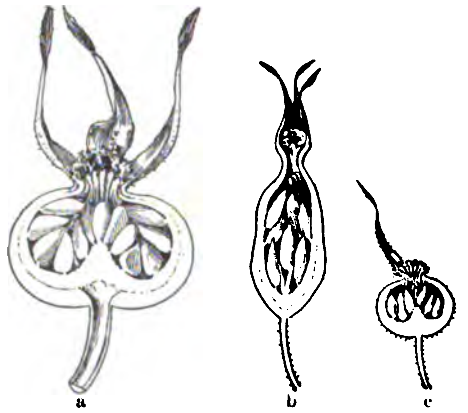
E. *Fls. usually corymbose: if solitary, pedicels with 1 or more bracts.*

F. *Stems with only one kind of prickles, sometimes mixed with glandular bristles: prickles usually hooked, stout, scattered: outer sepals usually pinnate*...
Section VI. Caninæ (Species Nos. 20–23)

FF. *Stems, at least at the base, with usually straight often slender prickles and numerous bristles gradually passing into prickles.*

Sepals after flowering spreading, usually entire, caducous: fr. usually hispid, with the akenes only at the bottom. (See Fig. 2148 *c*.)..........
Section VII. Carolinæ (Species Nos. 24–28)

Sepals after flowering upright, usually entire, rarely caducous: fr. usually smooth, with the akenes at the bottom and wall. (See Fig. 2148 *a, b*.)....................................
Section VIII. Cinnamomeæ (Species Nos. 29–41)



2148. Various forms of Rose hips. About natural size.
a, *Rosa rugosa*; b, *R. pendulina*; c, *R. humilis*.

2149. A spray of Rose hips.

EE. *Fls. solitary, without bracts, only occasionally corymbose; sepals erect, persistent.*

F. *Sepals entire: lvs. on the flowering branchlets usually 9-foliolate: prickles straight, slender, scattered, usually mixed with bristles: fls. white or yellow, rarely pink*....................
SECTION IX. PIMPINELLIFOLIÆ (Species No. 42)

FF. *Sepals pinnate at the outer edges: lvs. on flowering branchlets 5–7-foliolate.*

Prickles straight or hooked, rather stout: fls. yellow.........SECTION X. LUTEÆ (Species Nos. 43, 44)

Prickles slender, straight: fls. pink or white: lfts. not over ⅓ in. long, incised....................
SECTION XII. MINUTIFOLIÆ (Species Nos. 46, 47)

DDD. *Lvs. of flowering branchlets 11–15-foliolate.*

Prickles regularly in pairs below the base of petiole: inflorescence corymbose: fr. large, very prickly.......................................
SECTION XV. MICROPHYLLÆ (Species No. 50)

SUMMARY OF SECTIONS.

Number.	Name.	Species.
I	SYSTYLÆ	2–8
II	STYLOSÆ	9
III	INDICÆ	10–13
IV	BANKSIÆ	14, 15
V	GALLICÆ	16–19
VI	CANINÆ	20–23
VII	CAROLINÆ	24–28
VIII	CINNAMOMEÆ	29–41
IX	PIMPINELLIFOLIÆ	42
X	LUTEÆ	43, 44
XI	SERICEÆ	45
XII	MINUTIFOLIÆ	46, 47
XIII	BRACTEATÆ	48
XIV	LÆVIGATÆ	49
XV	MICROPHYLLÆ	50

SUBGENUS HULTHEMIA. *Only one Asiatic species, distinguished from all other Roses by the simple, exstipulate leaves.*

1. **Pérsica,** Michx. (*R. simplicifòlia*, Salisb. *R. berberifòlia*, Pall. *Lòwea berberifòlia*, Lindl.). Low straggling shrub, 2 ft. high, with slender, prickly branches: lvs. short-petioled, oval to oblong, acute at both ends, serrate, bluish green, pubescent, ¾–1⅛ in. long: fls. solitary, yellow, with red eye, about 1 in. across: fr. prickly. June. N. Persia to Siberia. B.M. 7096. B.R. 15:1261. G.C. III. 6:8, 9, 78.—This peculiar Rose is very rare in cultivation, since it is very difficult to grow. It has been successfully cult. in a cool greenhouse, exposed to the full sun, kept moist during summer and dry from October to March. The only way to propagate it seems to be by suckers; seeds are occasionally introduced from its native country. A hybrid of this species with *R. involucrata* is *R. Hárdii*, Cels., with 5–7-foliolate lvs. and large yellowish white fls., with a deep orange eye. G.C. II. 24:469. Gn. 19, p. 473 (as *R. simplicifolia*). P.M. 10:195.

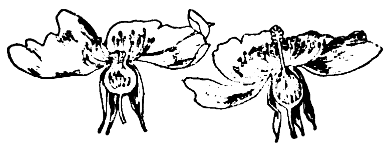
SUBGENUS EUROSA.

SECTION I. SYSTYLÆ. *A group of about 12 species (one of them American), well marked by the styles being connate into a slender exserted column. Stems sarmentose or climbing, with hooked prickles: fls. in corymbs, few or many: outer sepals pinnate, rarely entire, reflexed after flowering, caducous.*

KEY TO SPECIES OF SECTION I.

A. *Stipules pectinate: prickles usually in pairs*..........................2. **multiflora**
AA. *Stipules entire or denticulate: prickles scattered.*
B. *Lvs. of flowering branches 3–5-foliolate, pubescent beneath*....3. **Watsoniana**
4. **setigera**
BB. *Lvs. of flowering branchlets usually 9, glabrous*...............5. **Wichuraiana**
BBB. *Lvs. of flowering branchlets 5–7-foliolate.*
C. *Sepals ovate, abruptly acuminate: fl.-buds broadly ovate, abruptly pointed: corymbs usually few-fld*..............6. **sempervirens**
7. **arvensis**
CC. *Sepals lanceolate, gradually acuminate: fl.-buds elongated: corymbs usually many-fld*...................8. **moschata**

2. **multiflòra,** Thunb. (*R. polyántha*, Sieb. & Zucc. *R. intermèdia*, Carr. *R. Wichùræ*, Koch). Deciduous shrub, with vigorous, long, recurving or climbing branches: lfts. usually 9, obovate to oblong, acute or obtuse, serrate, pubescent, ¾–1⅓ in. long: fls. in many-fld. pyramidal corymbs, usually white, ¾ in. across or more; sepals ovate, abruptly acuminate; styles glabrous: fr. small, globular. June. Japan, China. B.M. 7119. G.F. 3:405; 4:535; 6:316, 317. A.G. 18:677. A.F. 6:1003. Gn. 49, p. 368 (as *R. microcarpa*); 55:432. Gng. 5:120, 121.—Var. **Thunbergiàna,** Thory, is the typical form, with small white single fls. Var. **cárnea,** Thory (var. *plèna*, Dipp. *R. flórida*, Poir.). With double light pink fls. B.M. 1059. B.R. 5:425. Var. **platyphýlla,** Thory, with larger lvs. and larger double, deep pink fls., is perhaps a hybrid. B.R. 16:1372. Many other hybrids have originated in cultivation; they usually show their parentage by the pectinate stipules. A hybrid with *R. rugosa* is *R. Iwára*, Sieb., with single, rather small fls. *R. polyántha*, Hort., not Sieb. & Zucc., is a trade name for hybrids with *R. Chinensis*. Gn. 29:530. The Dawson Rose, or *R. Dawsoniána*, is a hybrid with General Jacqueminot. A very beautiful hybrid and one of the best climbing Roses is Crimson Rambler (Fig. 2151), a vigorous grower, with large corymbs of bright



2150. Section of Rose flowers (× ⅓).
To show two forms of styles.

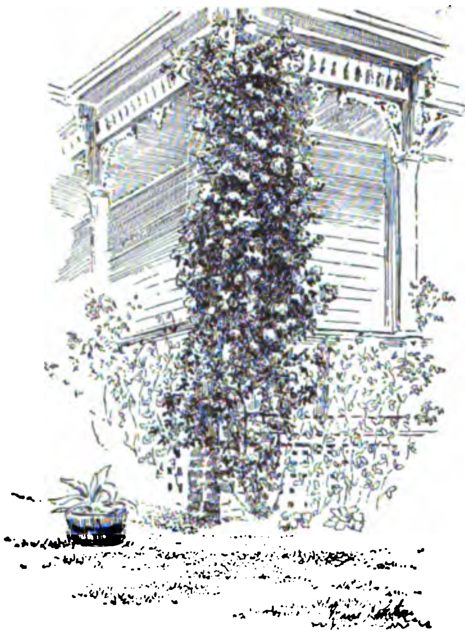
crimson fls. A.G. 16:233. Hybrids with *R. setigera* and *R. Wichuraiana* have also been raised.

3. **Watsoniàna,** Crép. Deciduous shrub, with sarmentose or recurving branches: lfts. 3–5, linear-lanceolate, with entire wavy margin, pubescent beneath, 1–2½ in. long: fls. in many-fld. pyramidal corymbs, ½ in. across or less, white; style glabrous: fr. small. June, July. R.B. 14, p. 183. G.F. 3:477.—A very curious Rose of unknown origin, supposed to have been introduced from Japan, but not known in a wild state. Not quite hardy north.

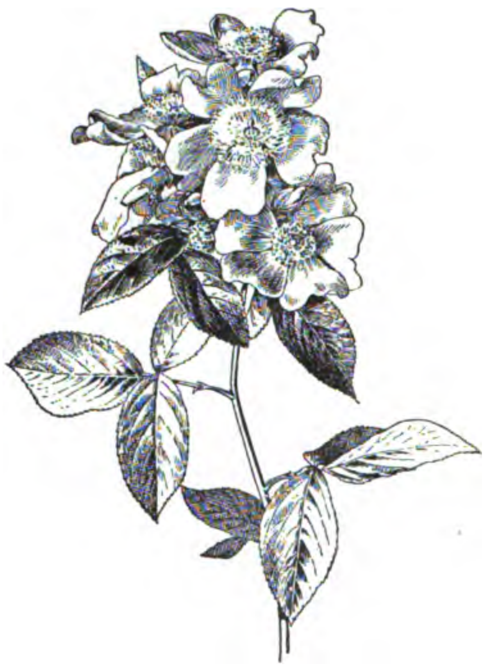
4. **setígera,** Michx. PRAIRIE ROSE. Figs. 2152–4. Shrub with prickly branches attaining 6 ft., with long and slender recurving or climbing branches: lfts. 3–5, oblong-ovate to lanceolate, shortly acuminate, serrate, tomentose beneath, 1–3 in. long: fls. in rather few-fld. corymbs, deep rose, fading to whitish, about 2 in. across, almost scentless: pedicels and receptacle glandular-hispid; style glabrous: fr. globular, ⅓ in. across. June, July. From Ontario and Wis. to Tex. and Fla. Mn. 8:65. G.F. 10:323. A.G. 13:196, 197; 16:229. Gng. 1:325. M.D.G. 1900:423.—Var. **tomentòsa,** Gray (*R. rubifòlia*, R. Br.). Lvs. more tomentose beneath: corymbs with more, but smaller fls. A valuable hardy climbing Rose. Several varieties with double fls. are in cultivation; some are probably hybrids with *R. arvensis*, *multiflora*, and other species.

5. **Wichuraiàna,** Crépin (*R. bracteàta*, Hort., not Wendl.). MEMORIAL ROSE. Fig. 2155. Half-evergreen shrub with prostrate and creeping branches: lfts. roundish or broadly obovate, usually obtuse, serrate, glabrous, shining above, ⅓–¾ in. long: corymbs few-fld. or many-fld., pyramidal: fls. white, fragrant, 1½–2 in. across; styles pubescent; pedicels slightly glandular-hispid: fr. ovoid, to ½ in. high. July–Sept. Japan. B.M. 7421 (as *R. Luciæ*). G.F. 4:569; 6:337. G.C. III. 22:99. R.H. 1898:105, 106. M.D.G. 1898:580–585.—A handsome Rose for covering banks and rockeries. A number of hybrids, especially with Hybrid Tea Roses, have been raised. G.F. 6:337. Mn. 8, p. 27, 156. Gng. 6:353–355. Var. **rùbra,** André, with single carmine fls., 1½–2 in. across, and the lvs. with 5–7, somewhat larger lfts., is a hybrid of *R. Wichuraiana* and *R. multiflora*, var. Crimson Rambler. R.H. 1901, p. 20.

6. **sempérvirens,** Linn. Evergreen shrub with long and slender sarmentose, somewhat reddish branches: lfts. 5-7, ovate-lanceolate, acuminate, serrulate, glabrous, shining above, ¾–2 in. long: fls. in few-fld. corymbs, sometimes 2 in. across, slightly fragrant; pedicels glandular-hispid; style usually pubescent: fr. subglobose or ovoid, orange-red. June, July. S. Europe, N. Afr. B.R. 6:465.—Var. **prostràta,** Nichols. (*R. prostràta*, Lindl.). Lfts. smaller, oval, acute: fr. ovoid. Var. **scándens,** Nichols. (*R. scándens*, Mill.). Lfts. oblong or oval, obtuse: fr. subglobose. There are some double-fld. garden forms, probably hybrids with other climbing Roses. Less hardy than the preceding and the following.



2151. Crimson Rambler Rose. See No. 2.



2152. Rosa setigera (× nearly ½). See No. 4.

7. **arvénsis,** Huds. (*R. rèpens*, Scop. *R. silvéstris*, Herrm.). Deciduous shrubs, with sarmentose or creeping stems: lfts. usually 7, ovate to ovate-elliptic, acute, serrate, dull above, glabrous or slightly pubescent beneath, rather thin, ½–1½ in. long: fls. in few-fld. corymbs, sometimes solitary, white, scentless, 1½–2 in. across; style glabrous: fr. ovoid. June, July. Europe. B.M. 2054.

Var. **capreolàta,** Neill. AYRSHIRE ROSE. Lfts. usually 5, larger: fls. double, white to deep pink. It may be a hybrid with *R. Gallica*. Hardy.

8. **moschàta,** Mill. (*R. Brunòni*, Lindl.). MUSK ROSE. Deciduous shrub with sarmentose or climbing branches: lfts. 5–7, oval or oblong, mostly acuminate, serrulate, usually pubescent beneath, 1–2½ in. long: fls. white, fragrant with the odor of musk, 1½–2 in. across, single or double; styles pubescent: fr. ovate, small. July. S. Asia, Abyssinia. B.R. 10.829. F.S. 4:366–367. B.M. 4030.—Naturalized in some localities in Ala. in a form with rather broad, acute or obtusish lvs. Var. **Abyssínica,** Crép. (*R. Abyssínica*, Lindl.). More prickly: flowering branchlets shorter; inflorescence more compact; sepals with smaller lobes. Var. **Leschenaùltii,** Crép. (*R. Leschenaùltii*, Wight & Arn.). Fls. larger, in few-fld. corymbs; pedicels and receptacle glandular-hispid. *R. Pissárdii*, Carr., a vigorous-growing Rose with numerous white fls., figured in R.H. 1880, p. 314, 315, is also a form of the Musk Rose. Several hybrids are known; the most important is *R. Noisettiana* (See No. 12). The Musk Rose is a handsome free-flowering climbing Rose, but is not hardy north.

SECTION II. STYLOSÆ. *Contains only one European species, with the appearance of a hybrid between R. arvensis and R. canina.*

9. **stylòsa,** Desv. Shrub, with long, arching branches, prickly: lfts. 5–7, ovate-oblong, acute, serrate, pubescent beneath, ¾–2 in. long: fls. in few-fld. corymbs, white or light pink, 1½–2 in. across; styles glabrous. June, July. W. Europe. Red. Ros. (1:5, 2).—Of little ornamental value.

SECTION III. INDICÆ. *Few Asiatic species with upright or procumbent stems; prickles scattered, hooked, few: lfts. 3–5, rarely 7: inflorescence 1–many-fld.: sepals entire or the outer ones sparingly pinnate, reflexed after flowering: bracts and stipules narrow, the latter with small, divergent auricles.*

10. **gigantèa,** Collett. Procumbent: flowering branches usually unarmed: lfts. usually 5, oval to broadly elliptic, serrate, glabrous, firm, 1½–3 in. long: fls. solitary, usually without bracts, white, 5–6 in. across; pedicels and receptacle smooth; sepals entire, long-acuminate. Burma. G.C. III. 6:13.—Hardy only south. It is possible that Fortune's Double Yellow (Beauty of Glazenwood), with large, double, salmon-yellow fls., figured in B. M. 4679, is a var. or hybrid of this species.

11. **Chinénsis,** Jacq. (*R. Índica*, Lindl., not Linn.). CHINA ROSE. BENGAL ROSE. Low, upright shrub, with slender branches, sometimes almost unarmed: lfts. 3–5, sometimes 7, ovate to oblong, acute, finely serrate, coriaceous, shining and dark green above, pale beneath, glabrous, 1–2½ in. long: fls. usually few or solitary, crimson, pink, white or yellowish, sometimes 3 in. across, fragrant: fr. usually obovate. Flowering all summer and fall. China. From this species and *R. Gallica* and its forms most of the Garden Roses have originated. Several vars. are known.

Var. **Devoniénsis,** Hort., is probably a hybrid: it is of vigorous growth, almost climbing, and has large, yellowish white, double flowers. P.M. 8:169.

Var. **fràgrans,** Thory (*R. Índica*, var. *odoratissima*, Linn.). TEA-SCENTED or TEA ROSE. Similar to the following but fls. more fragrant, salmon-pink or light rose: fr. ovate. B.R. 10:804. More tender than the other vars.

var. **Índica,** Koehne (*R. Índica*, var. *vulgàris*, Lindl.). MONTHLY ROSE. Stems rather stout, 3–5 ft. high, glaucous green, with brownish red prickles: fls. pink to whitish, with glandular pedicels: fr. obovate.

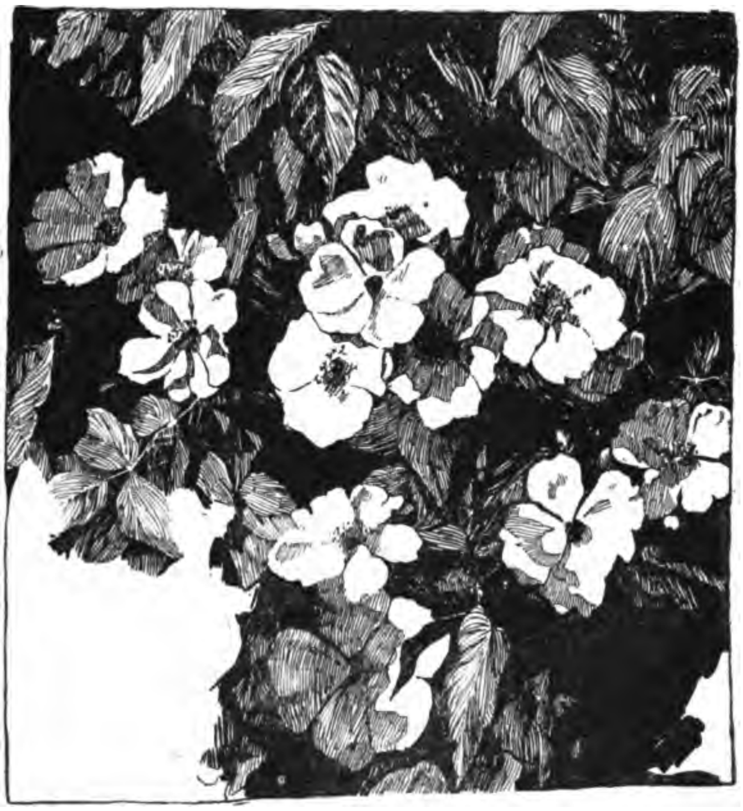
Var. **longifòlia,** Thory (*R. longifòlia*, Willd.). Lfts. lanceolate: fls. single, deep pink. Red. Ros. (3:25, 8).

Var. **mínima,** Curt. (*R. Lawrenciàna*, Hort. *R. Índica*, var. *pùmila*, Thory). Dwarf shrub, usually not over 1 ft. high, with small rose-red fls. about 1½ in. across; petals often pointed. There are single- and double-fld. forms. The FAIRY ROSES belong to this variety. B.M. 1762. Red. Ros. (3:25, 6, 7).

Var. **semperflòrens,** Nichols. (*R. semperflòrens*, Curt. *R. Bengalénsis*, Pers.). CRIMSON CHINESE ROSE. Low shrub, with slender, prickly or almost unarmed, dark green branches: lfts. rather thin, mostly stained with purple: fls. usually solitary on slender pedicels, crimson or deep pink. B.M. 284.

Var. **viridiflòra,** Dipp. GREEN ROSE. With monstrous green fls.; the petals are transformed into small, narrow green lvs. F.S. 11:1136.

Var. **Manétti,** Dipp. (*R. Manétti*, Hort.). Fig. 2156. Of vigorous growth, upright; pedicels hispid-glandular: fls. deep pink, single or semi-double. This variety has been recommended as a stock for forcing Roses; grows readily from cuttings, but is not quite hardy.



2153. Rosa setigera, or Prairie Rose. No. 4.

12. **Noisettiàna,** Thory. NOISETTE ROSE. CHAMPNEY ROSE. Supposed hybrid of *R. Chinensis* and *R. moschata.* Stems upright to 6 ft., with hooked reddish prickles: lfts. 5–7, usually oblong-lanceolate or oblong-ovate, glabrous: fls. usually in corymbs, light pink to red, sometimes yellow; styles glabrous. Blooms in summer and fall.—Numerous garden forms. The Noisette Rose was raised about 1817 by John Champney, of Charleston, S. C., from seed of the Musk Rose fertilized by a blush China Rose. From the seed of this hybrid Philippe Noisette, a florist at Charleston, obtained a Rose which was afterwards distributed as Blush Noisette by his brother Louis Noisette, of Paris.

13. **Borbónica,** Morren. BOURBON ROSE. Supposed hybrid of *R. Chinensis* and *R. Gallica*. Upright shrub, with prickly and often glandular-hispid branches: lvs. usually 7, ovate or ovate-lanceolate, acute, shining: fls. double or semi-double, usually purple, blooming in summer and fall. The Bourbon Roses are hardier than the Noisette, China and Tea-scented Roses, but require protection north. *R. Chinensis* and its varieties and hybrids (hybridizing with the hardier Roses of the Gallica group) have given rise to the Hybrid Perpetual or Remontant class. See Nos. 11 and 16.

2154. Baltimore Belle Rose—Rosa setigera (× ⅓). No. 4.

Section IV. Banksiæ. *Contains one Chinese species with climbing, sparingly prickly or unarmed stems: stipules quite free, subulate, caducous: sepals entire, reflexed after flowering, caducous.*

14. **Bánksiæ,** R. Br. Banks' Rose. Climbing to 20 ft., evergreen: lfts. 3–5, sometimes 7, elliptic-ovate to oblong-lanceolate, acute or obtusish, finely serrate, shining, glabrous except at the base of midrib beneath: fls. on slender, smooth pedicels in many-fld. umbels, yellow and single in the typical form, about 1 in. across, slightly fragrant. May, June. S. China. B.M. 7171.—Var. **alba-plèna** has double white fls. B.M. 1954. B.R. 5:397. Var. **lutea-plèna** has the fls. double yellow. B.R. 13:1105.

15. **Fortuneàna,** Lindl., is a hybrid of *R. Banksiæ* and *R. lævigata*. Climbing shrub, with sparingly prickly stems: lfts. 3–5: fls. large, double, white, on hispid pedicels. P.F.G. 2, p. 71.

Section V. Gallicæ. *Contains only one very variable species, native of Europe and W. Asia. Low, upright shrub; the stems with usually hooked prickles mixed with bristles: fls. few and often with narrow bracts or solitary on a usually bractless pedicel: sepals reflexed after flowering, caducous, the outer ones pinnate; upper stipules not dilated.*

A. *Lfts. doubly and glandular serrate*..16. **Gallica**
AA. *Lfts. simply serrate, not glandular.*
Supposed hybrids of R. Gallica...17. **Damascena**
18. **alba**
19. **turbinata**

16. **Gállica,** Linn. Upright shrub, rarely attaining 5 ft. high: lfts. 3–5, broadly oval or ovate, rounded at base, usually doubly serrate with glandular teeth, rugose above, pubescent beneath, deflexed, 1–2 in. long; rachis glandular-pubescent and often prickly: fls. on rather stout, upright, glandular-hispid and bristly pedicels, deep pink to crimson, 2–3 in. across; receptacle glandular-hispid: fr. subglobose or ovate, brick-red. June. M. and S. Eu., W. Asia.—The following are the most important forms: Var. **Ágatha,** Thory. With rather small, very double purple fls., the outer petals spreading, the inner ones concave. Red. Ros. (2:17, 17–21). Var. **incarnàta,** Voss (*R. incarnàta*, Mill.). Lfts. narrower, elliptic-ovate: rachis not prickly: flowering branches unarmed: fls. large, pale crimson, solitary: fr. ovoid. B.M. 7035. Var. **macrántha,** Hort., similar to the preceding, but fls. pale pink. Gn. 52:1148. Var. **officinàlis,** Thory (*R. provinciàlis*, Mill. Var. *plèna*, Regel), is the typical form but with double fls. Var. **pùmila,** Jacq. (*R. Austrìaca*, Crantz). Dwarf form, with creeping rootstock: fls. red, single. Red. Ros. (2:17, 2). Var. **centifòlia,** Regel (*R. centifòlia*, Linn.). Cabbage Rose. Lfts. usually 5, pubescent on both sides or only beneath, larger and thinner; rachis not prickly: fls. on longer and more slender pedicels, nodding, fragrant; petals inflexed. June, July. This Rose has been usually considered as a distinct species, but is without doubt only a form of *R. Gallica*, originated in cultivation. It has not been found wild, except with double fls., probably escaped from gardens. The following are forms of the Cabbage Rose: Var. **muscòsa,** Sér. (*R. muscòsa*, Ait.). Moss Rose. Fig. 2157. Fls. rose or white, with peduncles and calyx glandular-mossy. B.R. 2:102. B.M. 69. Gn. 18:242. Var. **cristàta,** Curt., is similar, but the sepals are doubly and incisely lobed: fls. rose-colored, large. B.M. 3475. Var. **pompònia,** Nouv. Duh. (*R. pompònia*, DC.). Dwarf form, with small lvs. and small double fls., about 1½ in. across, varying from white to red. *R. Burgundìaca*, Pers., *R. Dijonénsis*, Roessig, *R. pulchélla*, Willd., and *R. parvifòlia*, Ehrh., belong here. From *R. Gallica*, with its varieties, and *R. Damascena*, the Hybrid Perpetual or Remontant Roses have originated by hybridizing with *R. Chinensis* and its forms.

17. **Damascèna,** Mill. (*R. bìfera*, Pers. *R. calendàrum*, Borkh.). Damask Rose. Attaining 5 ft.: stems usually with numerous stout and hooked prickles, sometimes mixed with glandular bristles: lfts. usually 5, sometimes 7, ovate-oblong, serrate, more or less pubescent beneath, 1–2½ in. long; stipules sometimes pectinate; petioles prickly: fls. usually corymbose, double, red, pink or white, sometimes striped; pedicels and receptacles glandular-hispid: fr. obovate. June, July, and again in autumn. Origin unknown; introduced to Europe from Asia Minor in the sixteenth century.—Var. **trigintipétala,** Dieck, with semi-double red fls., is considered to be the Rose chiefly cultivated in southeast Europe for the manufacturing of attar. Gt. 38, p. 129. G.C. III. 7:45.

2155. Rosa Wichuraiana (× ⅓). See No. 5.

18. **álba,** Linn. Upright shrub, becoming 6 ft. high: stems with scattered hooked prickles and sometimes with bristles: lfts. usually 5, broadly ovate, serrate, pubescent beneath, 1–2 in. long; upper stipules dilated:

fls. single or double, solitary or several, white or blush, fragrant; pedicels glandular-hispid; receptacle usually smooth: fr. oblong, scarlet. June. Probably hybrid of *R. Gallica* and *R. canina*.

19. **turbinàta,** Ait. (*R. Francofurtàna*, Borkh.). Upright shrub, attaining 6 ft.: stems with straight or hooked prickles: flowering branches almost unarmed: lfts. 5–7, oval, serrate, pubescent beneath; upper stipules much dilated: fls. 1–3, single or double, purple, 2–3 in. across, slightly fragrant; pedicels and receptacle glandular-hispid only at the base; sepals erect after flowering, entire or nearly so: fr. turbinate. June. Supposed hybrid of *R. Gallica* and *R. cinnamomea*. Red. Ros. (3:23, 1).

SECTION VI. CANINÆ. *Many species in Europe, N. Africa and W. Asia. Upright shrubs, with scattered usually hooked and numerous prickles: upper stipules dilated: corymb usually many-fld., with dilated bracts: outer sepals pinnate, reflexed after flowering and caducous or erect and persistent.*

A. *Foliage pubescent on both sides or densely glandular*..................20. **villosa**
21. **rubiginosa**
AA. *Foliage glabrous or nearly so* ....22. **canina**
23. **ferruginea**

20. **villòsa,** Linn. (*R. pomífera*, Herrm.). Upright shrub, attaining 8 ft., with almost straight spines: lfts. 5–7, oval to ovate-oblong, acute or obtuse, doubly glandular-serrate, grayish green, pubescent above, tomentose beneath, ¾–2 in. long: fls. 1–3, pink, 1½–2 in. across on prickly pedicels: fr. scarlet, ovoid or subglobose, to 1 inch across, hispid, with persistent erect sepals. June, July. Eu., W. Asia.—Hardy Rose, with large ornamental fruit. Var. **mollissima,** Roth (*R. móllis*, Sm.). Lower, with shorter prickles, smaller, silky-pubescent lfts.: fr. smaller, less hispid.

21. **rubiginòsa,** Linn. (*R. Eglantèria*, Mill., not Linn.). SWEETBRIER. EGLANTINE. Dense shrub, attaining 6 ft., with hooked prickles often mixed with bristles: lfts. 5–7, orbicular to oval, doubly glandular-serrate, dark green above and glabrous, pale beneath and often pubescent, glandular on both sides, ½–1 in. long: fls. 1–3, on hispid short pedicels, bright pink, 1½–2 in. across; receptacle usually glandular-hispid: fr. subglobose or ovoid, orange-red to scarlet, with upright-spreading, usually caducous sepals. June. Europe; naturalized in some localities in the East. B.B. 2.232.—A handsome hardy Rose of compact habit, with bright green foliage exhaling a very agreeable aromatic odor. There are some double forms and hybrids with other species.

2156. The Manetti Rose (× ⅓).
Much used as a stock. See No. 11.

22. **canìna,** Linn. DOG ROSE. Upright shrub, attaining 10 ft., with often recurving branches: prickles stout, hooked: lfts. 5–7, oval or elliptic, doubly serrate, glabrous or slightly pubescent or somewhat glandular beneath, ¾–1½ in. long: fls. 1–3, light pink, on usually glabrous pedicels; sepals reflexed, caducous: fr. ovate, orange-red or scarlet, glabrous. June. Eu., N. Afr., W. Asia; naturalized in some localities.—Much used as a stock for grafting.

2157. Moss Rose.
See No. 16.

23. **ferruginea,** Vill. (*R. rubrifòlia*, Vill.). Upright shrub, attaining 6 ft., with slender, purplish branches covered with glaucous bloom: prickles few, hooked or straight: lfts. 7–9, elliptic to ovate-lanceolate, simply serrate, bluish green and more or less tinged with red, ¾–1½ in. long: fls. 1–3 or more, pink, 1½ in. across, on usually hispid-glandular pedicels; sepals long, with dilated apex, upright spreading, tardily caducous: fr. subglobose, scarlet. June. Mountains of M. and S. Eu. B.R. 5:430.—Effective by its reddish foliage: fls. less conspicuous. Hardy.

SECTION VII. CAROLINÆ. *Contains only American species. Upright, mostly low shrubs: stems slender, with usually straight prickles, placed in pairs and often mixed with bristles: upper stipules usually narrow: corymbs generally few-fld.: sepals spreading after flowering, caducous, the outer ones entire or with few erect lobes: akenes inserted exclusively at the bottom of the usually depressed-globose receptacle.*

A. *Pedicels rather long: lfts. 5–9*
  B. *Lfts. finely many-toothed: prickles usually hooked: stipules convolute.*24. **Carolina**
  BB. *Lfts. coarsely toothed: prickles usually straight and slender: stipules flat*..............................25. **lucida**
26. **humilis**
27. **nitida**
AA. *Pedicels very short: lfts. 7–11, small and narrow*..........................28. **foliolosa**

24. **Carolina,** Linn. (*R. palústris*, Marsh. *R. corymbòsa*, Ehrh. *R. Pennsylvánica*, Michx.). Fig. 2158. Upright shrub, attaining 8 ft., with slender stems: lfts. usually 7, elliptic to narrow-oblong, acute at both ends, usually pubescent beneath, ¾–2 in. long; stipules narrow: fls usually corymbose, pink, about 2 in. across: fr. depressed-globose, glandular-hispid, about ⅓ in. high, like those of the following species. June–Aug. Nova Scotia to Minn., south to Fla. and Miss., preferring swampy and moist ground. G.W.F. 35. Em. 2:488. Mn. 1, p. 86.—Var. **Nuttalliàna,** Hort., has larger fls. appearing later and continuing until September.

25. **lùcida,** Ehrh. (*R. hùmilis*, var. *lùcida*, Best). Shrub, 6 ft. high, with few or no suckers: prickles sometimes hooked: lfts. 7–9, elliptic to obovate-elliptic, dark green and shining above, thickish, often slightly pubescent beneath, ½–1½ in. long; stipules somewhat dilated: fls. usually few or solitary, about 2 in. across; sepals usually entire: fr. like that of the preceding. June, July. Newfoundland to N. Y. and Pa. B.B. 2:231. Gn. 55, p. 428.—Well adapted for borders of shrubberies, handsome in summer with its shining foliage and bright pink flowers; ornamental in winter with the brownish red stems and red fruits, remaining plump until the following spring. Var. **álba,** Hort., has white fls. and green stems. A.F. 12:1098. Gng. 5:306. Var. **plèna,** Hort. With double fls. *R. Ràpa*, Bosc, is also supposed to be a double-fld. var. or perhaps hybrid of this species.

26. **hùmilis,** Marsh. (*R. parviflòra*, Ehrh. *R. Lỳoni*, Pursh). Fig. 2148 *c*. Shrub, 3 ft. or sometimes 6 ft. high, spreading by means of numerous suckers, with slender prickles and usually numerous bristles: lfts. 5–7, resembling those of the former but narrower, thinner, not shining, usually pubescent beneath: fls. often solitary; outer sepals lobed. June. Maine to Ga., west to Wis. and Ind. Terr. Much resembling the preceding, which is often considered a var. of this species.—Var. **villòsa,** Best. Lvs. villous-pubescent beneath, thickish.

2158. **Rosa Carolina** (× ½). See No. 24.

27. **nítida,** Willd. Low upright shrub, 1½ ft. high: branches covered with straight prickles and numerous bristles: lfts. 7–9, narrowly oblong, acute at both ends, bright green and shining above, glabrous, ½–1 in. long: fls. usually solitary, 1–2 in. across, on slender glandular-hispid pedicels; sepals entire. June, July. Newfoundland to Mass. B.B. 2:231.

28. **foliolòsa,** Nutt. Low shrub, 1½ ft. high: stems with rather few slender prickles, sometimes almost unarmed: lfts. 7–9, narrow or linear-oblong, bright green and shining above, glabrous or pubescent on the midrib beneath, ½–1 in. long: fls. solitary or few, pink, about 1½ in. across; pedicels and receptacle smooth or sparingly glandular-hispid: fr. globose, with rather few akenes. May, June. Ark. and Ind. Terr. to Tex. G.F. 3:101.—Like the preceding, a handsome dwarf shrub with graceful foliage.

SECTION VIII. CINNAMOMEÆ. *Many American, Asiatic and European species. Erect shrubs, with usually straight prickles, in pairs or scattered, and often with numerous bristles: lfts. 5–9: upper stipules dilated: corymbs usually many-fld., with dilated bracts: sepals generally entire, upright after flowering and persistent, rarely deciduous; receptacle usually smooth.*

- A. *Prickles in pairs at the base of petioles: branches glabrous.*
  - B. *Sepals deciduous: fr. about ¼ in. across, with very few akenes*...29. **gymnocarpa**
  - BB. *Sepals persistent, erect after flowering.*
    - C. *Stipules flat.*
      - D. *Fls. in usually many-fld. corymbs, usually 1½ in. across (larger and sometimes solitary in Nos. 31 and 32): fr. about ⅓ in. across: stipules usually entire and narrow.*
        - E. *Fr. globose, with no or very short neck, about ⅓ in. high (sometimes ovate in No. 31).*
          - F. *Sepals quite entire*....30. **pisocarpa**
            31. **Fendleri**
          - FF. *Sepals with few lobes on the outer margins*....32. **Woodsii**
        - EE. *Fr. globose-ovate, with prominent neck, ½ in. high*....................33. **Californica**
      - DD. *Fls. usually solitary, 2 in. across or more: fr. ½ in. across: stipules dilated, glandular-ciliate*.........34. **Nutkana**
    - CC. *Stipules convolute, dilated*....35. **cinnamomea**
- AA. *Prickles scattered, sometimes in pairs in No. 41.*
  - B. *Stems and branches almost unarmed, without bristles*........36. **pendulina**
    37. **reclinata**
    38. **Virginiana**
  - BB. *Stems and branches with numerous prickles and bristles.*
    - C. *Branches and prickles glabrous.*
      - D. *Fls. corymbose: fr. with spreading sepals*.........39. **Arkansana**
      - DD. *Fls. solitary: fr. with erect sepals*....................40. **acicularis**
    - CC. *Branches and prickles tomentose or pubescent*............41. **rugosa**

29. **gymnocárpa,** Nutt. Stems slender, attaining 10 ft., with straight slender prickles and bristles: lfts. 5–9, broadly elliptic to oblong, doubly glandular-serrate, usually glabrous, ½–1 in. long: fls. solitary or few, pale pink, about 1 in. across; sepals short: fr. orange-red. June, July. Brit. Col. to Calif., east to Mont.

30. **pisocárpa,** Gray. Stems slender, with slender, straight or ascending prickles, without bristles, sometimes unarmed: lfts. 5–7, oblong to oblong-obovate, simply serrate, pubescent beneath, ½–1½ in. long: fls. pink, about 1 in. across, on short usually smooth pedicels: fr. globose, with a very short neck. June to Aug. Brit. Col. to Ore. B.M. 6857.

31. **Féndleri,** Crép. Stems 8 ft. high, with slender or recurved prickles, sometimes unarmed: lfts. 5–7, oblong to oblong-obovate, cuneate at the base, simply serrate, usually glaucous, finely pubescent beneath or glabrous, sometimes glandular, ½–1½ in. long: fls. sometimes solitary, pink; pedicels short, smooth: fr. globose, sometimes ovate, bright red, with little or no neck. June, July. Brit. Col. to W. Tex. and New Mex. B.R. 2:230 (as *R. Woodsii*).—Very decorative in fruit, which remains during the whole winter.

32. **Wòodsii,** Lindl. Stems 3 ft. high, with slender, straight or recurved prickles, often bristly: lfts. 5–7, obovate to oblong, simply or doubly glandular-serrate, pubescent or glabrous beneath, ½–1½ in. long: fls. often solitary, pink, 1½–2 in. across, on very short smooth pedicels: fr. globose, with short neck. June, July. Saskatchewan to Colo. and Mo. B.R. 12:976.—The two preceding species may be only vars. of *R. Woodsii*.

33. **Califórnica,** Cham. & Schlecht. Stems 8 ft. high, with stout, hooked or straight prickles, often bristly: lfts. 5–7, broadly elliptic to oblong-obovate, simply or

doubly glandular-serrate, pubescent beneath or on both sides, often glandular, rarely glabrous, ½–1½ in. long: fls. on slender, usually smooth pedicels, over 1 in. across. June–Aug. Brit. Col. to Calif.

2159. Rosa cinnamomea (× ⅓).
One of the old-fashioned hardy Roses. No. 35.

34. **Nutkàna,** Presl. Stems stout, 5 ft. high, with usually straight prickles and sometimes bristly: lfts. 5–7, broadly elliptic to oblong-lanceolate, generally rounded at the base, usually doubly glandular-serrate, almost glabrous, often glandular beneath, ½–2 in. long. June, July. Alaska to Ore. and Utah. G.F. 1:449.—Has the largest fls. of the western species. Var. **hispida,** Fernald, has the receptacle glandular-hispid.

35. **cinnamòmea,** Linn. CINNAMON ROSE. Figs. 2159, 2160. Stems slender, 6 ft. high, with hooked prickles, flowering branches sometimes unarmed: lfts. 5–7, sometimes 3 on lvs. of flowering branchlets, oblong, simply serrate, dull green, densely pubescent beneath, ½–1½ in. long: fls. solitary or few, purple, about 2 in. across, on short, naked pedicels: fr. depressed-globular, scarlet. May, June. Europe, N. and W. Asia. A.G. 13:343. —Var. **fœcundissima,** Voss (*R. fœcundíssima*, Muench). With double fls. Sometimes escaped from cultivation in the East.

36. **pendulina,** Linn. (*R. alpìna*, Linn.). Fig. 2148*b*. Stems slender, 3 ft. high: lfts. 7–9, oblong-ovate or oblong-elliptic, obtuse, doubly glandular-serrate, usually glabrous, ½–1½ in. long: fls. pink, usually solitary or 2–5, to 2 in. across; pedicels and receptacle usually smooth: fr. usually nodding, oblong or ovate, with elongated neck, scarlet. May, June. Mts. of Europe. B.R. 5:424. —Handsome free-flowering shrub. Var. **Pyrenàica,** W. D. Koch (*R. Pyrenàica*, Gouan.). Dwarf, with the pedicels and usually also the receptacles glandular-hispid. B.M. 6724. Gn. 27:496.

37. **reclinàta,** Thory (*R. Boursaùlti*, Hort.). Supposed hybrid of *R. pendulina* and *R. Chinensis*. Climbing to 12 ft., with slender, sparingly prickly branches: lfts. 3–7, oblong-ovate, glabrous: fls. in corymbs, purple, double or semi-double, nodding: fr. subglobose, smooth. Red. Ros. (3:26, 3).—Varying with lighter and deeper colored and more or less double fls.

38. **Virginiàna,** Mill. (*R. blánda*, Ait. *R. fraxinifòlia*, Borkh.). Stems slender, 5 ft. high, with few slender prickles or unarmed: lfts. 5–7, elliptic to obovate-oblong, usually acute, simply serrate, glabrous or pubescent beneath, ½–2½ in. long; stipules dilated: fls. usually several, pink, 2–2½ in. across, on smooth peduncles: fr. globular, sometimes elongated. May, June. Newfoundland to N. Y., west to Wis. and Ill. B.B. 2:229.

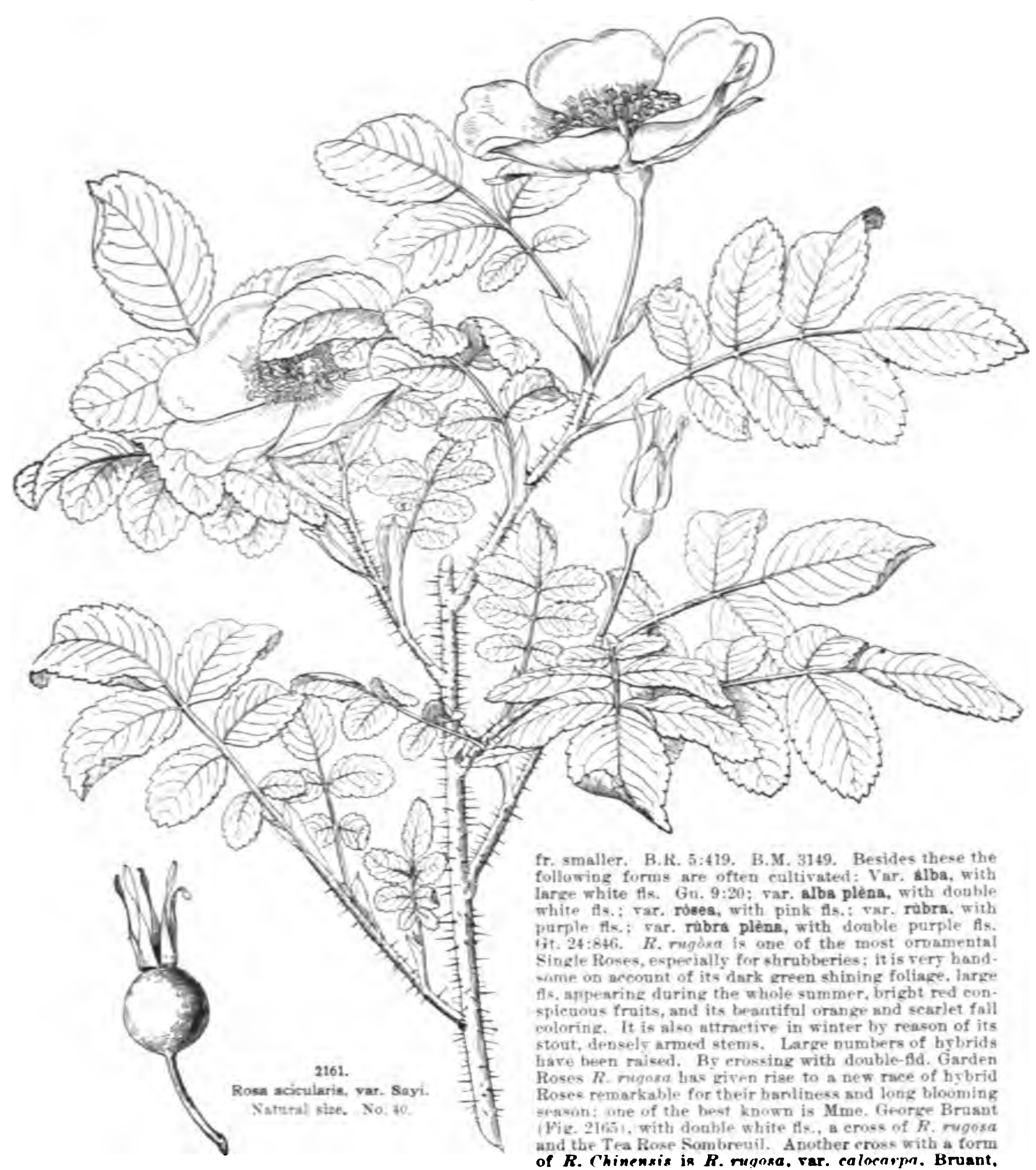
39. **Arkansàna,** Porter (*R. blánda*, var. *setígera*, Crép., and var. *Arkansàna*, Best). Stems low, sometimes 6 ft. high; lfts. 7–9, broadly elliptic to obovate, usually cuneate at the base, simply serrate, more or less pubescent beneath, ½–2 in. long; stipules usually entire: fls. corymbose, rarely solitary, pink, sometimes white, 1½–2 in. across; outer sepals with one or few lobes. June, July. Minn. and Brit. Col. to New Mexico. B.B. 2:230. Mn. 3:116.—Adapted for covering dry slopes and barren places. According to E. L. Greene, the true *R. Arkansana* is restricted to Colorado and perhaps New Mexico, while the form common in the regions north and west of these localities is a different species, for which he proposes the name *R. pratincola;* this form is described above. The true *R. Arkansana*, Porter, differs by its glabrous foliage, glandular and bristly stipules and reflexed sepals. At the same place (Pittonia, 4:10–14) Greene describes four other new species belonging to this section.

40. **aciculàris,** Lindl. Stems low, densely prickly: lfts. 3–7, broadly elliptic to narrowly oblong, rounded at base, simply or doubly serrate, pubescent beneath, ½–2 in. long: fls. solitary, deep rose, 1½–2 in. across, fragrant; sepals entire and nearly glabrous: fr. globular to oblong, ½–1 in. long. May, June. Alaska to Ontario and Colo., N. Eu., N. Asia, Jap.—A very variable species.

Var. **Sàyi,** Rehd. (*R. aciculàris*, var. *Bourgeauiàna*, Crép., partly). Fig. 2161. Lfts. glandular and pubescent beneath, usually somewhat doubly glandular-serrate: fls. larger, often 2½ in. across: fr. usually globular. Ontario to Brit. Col. and Colo. B.B. 2:1967. Var. **Engelmanni,** Crép. in herb. (*R. Engelmanni*, Wats.) Similar to the preceding: lfts. distinctly doubly glandular-serrate: fr. oblong, to 1 in. long. Colo. to Brit. Col. G.F. 2:377. Var. **Nipponénsis,** Hook. f. Lfts. smaller, ½–¾ in. long; petioles bristly: branchlets and pedicels glandular-hispid: fls. 1½ in. across. Japan. B.M. 7646.

2160. Rosa cinnamomea.
See No. 35.

41. **rugòsa,** Thunb. Figs. 2148*a*, 2162–4. Upright shrub, attaining 6 ft., with stout stems densely beset with prickles and bristles: lfts. 5–9, oval to obovate-oval, rugose, shining and dark green above, glaucescent and



2161.
Rosa acicularis, var. Sayi.
Natural size. No. 40.

pubescent beneath, thick and firm, $\frac{3}{4}$–2 **in. long; petioles tomentose and bristly: stipules dilated: fls. solitary or few, purple or white,** 2½–3½ **in. across: bracts large; pedicels prickly; receptacle smooth: fr. depressed-globose, brick-red, to 1 in. across. May–Sept. N. China, Corea, Jap.—Very variable species. Vars. fèrox,** C. A. Mey. (var. *Thunbergiàna*, C. A. Mey. *R. fèrox*, Lawr. *R. Regeliàna*, André & Lind. *R. Andrèæ*, Lange). Stout and densely armed: lvs. thick, very rugose and shining: fls. large, 3½ in. across: fr. 1 in. across. S.Z. 1:28. B.R. 5:420. Gt. 30:1049; 42, p. 537. G.C. II. 14:372. Gn. 46, p. 324; 52:1144; 55, p. 434. I.H. 18:47. Gng. 1:7; 5:339. A.G. 13:342, 344; 18:567. Var. **Kamschática,** Regel (*R. Kamschática*, Vent.). Less densely armed: lvs. thinner, less rugose: fls. and fr. smaller. B.R. 5:419. B.M. 3149. Besides these the following forms are often cultivated: Var. **álba,** with large white fls. Gn. 9:20; var. **alba plèna,** with double white fls.; var. **ròsea,** with pink fls.; var. **rùbra,** with purple fls.; var. **rùbra plèna,** with double purple fls. Gt. 24:846. *R. rugòsa* is one of the most ornamental Single Roses, especially for shrubberies; it is very handsome on account of its dark green shining foliage, large fls. appearing during the whole summer, bright red conspicuous fruits, and its beautiful orange and scarlet fall coloring. It is also attractive in winter by reason of its stout, densely armed stems. Large numbers of hybrids have been raised. By crossing with double-fld. Garden Roses *R. rugosa* has given rise to a new race of hybrid Roses remarkable for their hardiness and long blooming season; one of the best known is Mme. George Bruant (Fig. 2165), with double white fls., a cross of *R. rugosa* and the Tea Rose Sombreuil. Another cross with a form of *R. Chinensis* is *R. rugosa*, var. *calocarpa*, Bruant, with single rose-colored fls. and handsome fr. produced very abundantly. Gn. 46, p. 548; 52, p. 384. R.H. 1895, p. 446, 447. I.H. 42, p. 15. Hybrids are also known with *R. multiflora*, *R. cinnamomea*, *R. microphylla*, *R. spinosissima*, *R. Wichuraiana* and *R. humilis*, and there are probably others.

SECTION IX. PIMPINELLIFOLIÆ. *Few Old World species. Upright shrubs, usually low: prickles straight, scattered, usually numerous and mixed with bristles: lfts. very small, usually 9: stipules narrow, with divergent and dilated auricles: fls. solitary, without bracts: sepals entire, erect and persistent.*

42. **spinosíssima,** Linn. (*R. pimpinellifòlia*, Linn.). SCOTCH ROSE. Low shrub, with upright recurving or

spreading branches, 3 or 4 ft. high, usually densely beset with slender prickles and bristles: lfts. 5–11, usually 9, orbicular to oblong-ovate, simply or doubly serrate, glabrous, sometimes glandular beneath, ¼–¾ in. long: fls. solitary, but usually very numerous along the stems, pink, white or yellowish, 1¼–2 in. across; pedicels smooth or glandular-hispid: fr. globular, black. May, June. Eu., W. Asia to China. Gn. 55, p. 425.—Very variable. Var. Altàica, Thory (*R. Altàica*, Willd. *R. grandiflòra*, Lindl.). More vigorous: fls. large, white; pedicels smooth. B.R. 11:888. Gn. 53:1159. A.F. 12:1099. Gng. 5:307.

Var. **hispida,** Koehne (*R. hispida*, Sims. *R. lutéscens*, Pursh). Taller: lfts. simply serrate, pedicels smooth: fls. yellowish, rather large. B.M. 1570. Gn. 56:1249.

Var. **mitissima,** W. D. Koch (var. *inérmis*, Thory. *R. mitíssima*, Gmelin). Branches almost unarmed: fls. pink.

Var. **myriacántha,** W. D. Koch (*R. myriacantha*, DC.). Branches very prickly: lvs. doubly glandular-serrate, very small: fls. small, white, blushed. Red. Ros. (1:6,7). There are also vars. with double or semi-double, pink, white or yellow fls. (Gn. 29:544). Several hybrids are known. *R. Hibérnica*, Smith, a low shrub with glaucous green foliage and small pale pink fls., is a hybrid with *R. canina*. *R. rubélla*, Smith, with dark green foliage, red fls. and scarlet, pendulous ovate-oblong fruits, is a hybrid with *R. pendulina*. *R. revérsa*, Waldst. & Kit., is similar and probably of the same parentage.

SECTION X. LUTEÆ. *Two Asiatic species. Upright or somewhat sarmentose shrubs, with scattered, straight or hooked prickles: stipules usually narrow, with divergent and dilated auricles: fls. yellow, without bracts: sepals entire, persistent, upright.*

43. **Eglantèria,** Linn., not Mill. (*R. lùtea*, Mill.). Shrub with long, slender often sarmentose or climbing stems, **becoming 10 ft. high, usually with straight prickles: lfts. 5–9, broadly ovate to oval, doubly glandular-serrate, dark green above, often glandular, ½–2 in. long; stipules glandular-serrate: fls. sometimes several, but without bracts to the main pedicel, bright yellow, 2–2½ in. across, of unpleasant odor: fr. globular. June. W. Asia. B.M. 363 Gn. 53:1152.—Var. punicea,** Thory (*R. punícea*, Mill. *R. bicolor*, Jacq.). Fls. orange-scarlet within, B.M. 1077. Gn. 53. p. 23; 55, p. 425. Var. **plèna,** Hort. With double fls. Gn. 53:1152. See No. 21.

2163. Fruits of Rosa rugosa (× ¼). No. 41.

2162. Rosa rugosa. Natural size. No. 41.

44. **hemisphærica,** Herrm. (*R. glaucophýlla*, Ehrh. *R. sulphùrea*, Ait. *R. Rapíni*, Boiss. & Bal.). Closely allied to the preceding: stems slender, with hooked prickles: lfts. obovate, cuneate at the base, simply serrate, bluish green: fls. usually solitary, scentless, light yellow; pedicels glandular-hispid. June. W. Asia.—

2164. Semi-double Rosa rugosa. (× ½.) No. 41.

Var. **plèna,** Hort. With double fls., often cult. under the name of Persian Yellow. B.R. 1:46. F.S. 4:374. S.B.F.G. II. 4:353.

Var. **Hárisoni,** Hort., Harrison's Yellow Rose, is of paler color and a little less double than Persian Yellow, but it blooms more freely, is more vigorous, hardier and easier to grow. It is of American origin and may be a hybrid of Persian Yellow with *Rosa spinosissima*.

SECTION XI. SERICEÆ. *One Asiatic species. Erect shrub, with the prickles in pairs: stipules narrow, with erect dilated auricles: fls. solitary, without bracts: sepals entire, persistent and upright.*

45. **sericea,** Lindl. (*R. tetrapétala*, Royle). Attaining 12 ft., with prickly and often bristly branches: lfts. 7–9, oval or obovate, serrate, glandular or silky pubescent beneath, ½–¾ in. long: fls. white, 1½–2 in. across; petals usually 4, sometimes 5: fr. globose or turbinate. May, June. Himal. B.M. 5200. R.H. 1897, p. 444, 445.

SECTION XII. MINUTIFOLIÆ. *Two American species. Low shrubs with slender, scattered prickles: lfts. small, incised-serrate; stipules with dilated and divergent auricles: fls. solitary, without bracts: sepals erect, persistent, the outer ones pinnate.*

46. **minutifòlia,** Engelm. Dense spreading shrub, 4 ft. high: lfts. 5–7, ovate to oblong, incisely dentate, puberulous, ⅛–⅓ in. long: fls. short-pedicelled, pink or white, about 1 in. across: fr. hispid. April, May. Calif. G.F. 1:102.

47. **stellàta,** Wooton. Similar to the preceding: lfts. 3–5, broadly cuneate-obovate: fls. 1¾–2¼ in. across, deep rose-purple. New Mex. Bull. Torrey Bot. Club 25:335.—This and the preceding would be handsome shrubs for rockeries, especially the latter, on account of its larger fls. Both are probably tender and probably are not yet in cult.

2165. Bud of Madame Georges Bruant Rose (× ⅝).
One of the Rugosa hybrids. No. 41.

SECTION XIII. BRACTEATÆ. *Two Asiatic species. Shrubs with erect or sarmentose and tomentose or pubescent stems; prickles in pairs: stipules slightly adnate and pectinate: inflorescence with large bracts: sepals reflexed after flowering, entire: receptacle tomentose.*

48. **bracteàta,** Wendl. (*R. Macártnea*, Dum.). MACARTNEY ROSE. Stems usually procumbent or sarmentose, villous-tomentose, with stout hooked prickles: lfts. 5–9, oval to obovate, crenately serrulate, bright green above and somewhat shining, almost glabrous beneath, ½–2 in. long: fls. one or few, short-stalked, white, 2–2¾ in. across; sepals and receptacle densely tomentose. June–Oct. S. China, Formosa; naturalized in Fla. and La. B.M. 1377.—Handsome half-evergreen climber, not hardy north.

SECTION XIV. LÆVIGATÆ. *One Asiatic species. Climbing shrub, with scattered hooked prickles: lfts. generally 3: stipules almost free: fls. solitary, without bracts, large, white: sepals erect, entire, persistent.*

49. **lævigàta,** Michx. (*R. Sínica*, Murr. *R. Cherokénsis*, Donn. *R. ternàta*, Poir. *R. Camèllia*, Hort.). Figs. 2166, 2167. High climbing shrub, with slender green prickly branches: lfts. 3, rarely 5, elliptic-ovate to ovate-lanceolate, sharply serrate, shining and glabrous, 1½–2½ in. long: fls. solitary, white, rarely rose, 2½–3½ in. across, fragrant; pedicels and receptacle densely bristly: fr. large, obovate, bristly. June. China, Formosa, Japan; naturalized in the southern states. B.M. 2847. B.R. 23:1922. G.C. III. 6:497 Gn. 53, p. 207.—Handsome climbing Rose, but not hardy north. A hybrid with *R. Bánksiæ* is *R. Fortuneàna* (see No. 15). A hybrid with a Tea Rose is the Anemone Rose, with large single light pink fls. M.D.G. 1896:345.

SECTION XV. MICROPHYLLÆ. *One Asiatic species. Upright spreading shrub, with the straight prickles in pairs: fls. 11–15; stipules very narrow, with subulate divergent auricles: fls. usually several, with small and quickly caducous bracts; sepals broad, erect and persistent, the outer ones pinnate; carpels only at the bottom of receptacle.*

50. **micróphylla,** Roxb. Much-branched spreading shrub 6 ft. high, with straight or ascending prickles: lfts. 11–15, elliptic to oblong-elliptic, acute, sharply serrate, glabrous or pubescent beneath: fls. pale pink, often solitary, 2–2½ in. across, short-pedicelled; sepals and receptacle prickly: fr. depressed-globose, 1½–2 in. across, very prickly. June, July. China, Japan. B.M. 6548.—Var. **plèna,** Hort. With double fls. B.M. 3490. B.R. 11:919. Not quite hardy north. Sometimes hybrids with *R. Chinensis* and with *R. rugosa* are cult. under the name of *R. microphylla*. The hybrid with *R. rugosa* has large single purple fls., handsome bright green foliage and very prickly branches; it is of vigorous growth and will probably make a good hedge plant.

2166. Cherokee Rose—Rosa lævigata (× ½).
Commonly known as *R. Sinica*. No. 49.

SUPPLEMENTARY LIST.

(The Roman figure indicates the group to which the species belongs.)

R. agréstis, Savi. (VI). Allied to R. rubiginosa. Without bristles; pedicels smooth: fls. small, pale pink or whitish. Eu., N. Afr.—*R. Alberti*, Regel (VIII). Allied to R. acicularis. Branches slender, recurving: lfts. ovate, pubescent beneath: fls. white; pedicels smooth. Songaria, Turkestan.—*R. Amoyénsis*, Hance = R. microcarpa.—*R. anemoniflòra*, Fort. (I). Half-evergreen climbing shrub: lfts. 3–5, dark green, glabrous and shining: fls. few, deep carmine, double. China. Half-hardy.—*R. anserinæfòlia*, Boiss., is a variety of R. Beggeriana, with silky pubescent lfts.—*R. Beggeriàna*, Schrank (VIII). Dense shrub, to 3 ft.: prickles in pairs: lfts. very small and bluish green: fls. corymbose, white; calyx and apex of fr. falling off, leaving the small, globular fr. with an opening at the top. N. Persia to Altai and Song.—*R. clinophýlla*, Thory (XIII). Closely allied to R. bracteata. Branches silky pubescent: prickles straight: lfts. elliptic-lanceolate, tomentose beneath: fls. white. India. B.R. 9:739. Tender.—*R. collìna*, Jacq. (V). Allied to R. alba, but fls. rose-colored; sepals shorter. Probably hybrid of R. Gallica with R. canina, var. dumetorum.—*R. coriifòlia*, Fries (VI). Allied to R. canina. Lfts. pubescent beneath; petioles tomentose: fls. pink, short-pedicelled; bracts large; sepals upright after flowering. Eu., W. Asia. Very variable. Var. Frœbeli, Rehd. (R. canina, var. Frœbeli, Christ.). Of vigorous growth: lfts. simply or doubly serrate, bluish green: fls. small, white.—*R. Davùrica*, Pall. (VIII). Allied to R. cinnamomea. Prickles straight and slender; stipules narrow: lfts. smaller, doubly serrate: pedicels longer, glandular: fr. ovate. Manchuria, Dahur., Saghalin.—*R. Ecæ*, Aitch = R. xanthina.—*R. ellíptica*, Tausch (VI). Allied to R. rubiginosa: lfts. cuneate-obovate, pubescent beneath: pedicels short, usually not glandular: fls. pinkish or whitish. Eu.—*R. Elymaìtica*, Boiss. & Hausskn. (VI). Dwarf shrub, to 3 ft., with prickly zigzag branches: lfts. small, usually 5, glaucescent: fls. 1–3, small, pink: fr. globular, small. N. Persia.—*R. Fedtschenkoàna*, Regel (VIII). Probably variety of R. Webbiana, of more vigorous growth and with larger lfts. Turkestan.—*R. fèrox*, Bieb. (VI). Allied to R. rubiginosa. Dwarf: lfts. glandular on both sides: pedicels short, not glandular. S. E. Eu., W. Asia.—*R. Frœbeli*, Hort. = R. coriifolia, var. Frœbeli.—*R. glaùca*, Vill. (VI). Allied to R. canina. Lfts. broadly ovate, bluish green: fls. pink; sepals upright after flowering. Eu.—*R. glutinòsa*, Sibth. & Sm. (VI). Allied to R. rubiginosa. Dwarf, densely prickly: lfts. densely glandular on both sides: fls. small, pink. S. E. Eu., W. Asia.—*R. Heckeliàna*, Tratt. (R. Hackeliana, Nym.) (VI). Allied to R. rubiginosa. Dwarf: lfts. tomentose on both sides: fls. usually solitary, small, pink. S. Eu.—*R. gratíssima*, Greene (VIII). Allied to R. Californica. Lfts. glabrous, bright green and glandular, fragrant, thin. Calif.—*R. Indica*, Linn. = R. microcarpa.—*R. involucràta*, Roxb. = R. clinophylla.—*R. involùta*, Smith (VI). Probably hybrid of R. spinosissima and R. villosa. Lfts. doubly glandular-serrate, tomentose beneath: fls. whitish.—*R. Jundzìlli*, Bess. (VI). Allied to R. canina, but resembling also R. Gallica. Upright shrub, with straight spines: lfts. almost glabrous, doubly glandular-serrate, rather large: fls. large, pink; fr. subglobose. Eu., W. Asia.—*R. láxa*, Retz. (VIII). Upright shrub, with hooked prickles in pairs: lfts. 7–9, small, light green: fls. small, white: fr. oblong-ovate, small. Turkestan to Song. and Altai.—*R. láxa*, Lindl. = R. lucida.—*R. láxa*, Hort. = R. coriifolia, var. Frœbeli.—*R. Lùciæ*, Franch. & Rochebr. (I). Allied to R. Wichuraiana. Habit more upright: lfts. usually 7, narrower and thinner: fls. smaller. Japan.—*R. Lyelli*, Lindl. Probably hybrid of R. moschata and R. clinophylla. Climbing: lfts. usually 7, oblong, shining: fls. corymbose, large, white, single or double. Introduced from Nepal.—*R. macrophýlla*, Lindl. (VIII). Upright shrub, with straight spines in pairs: lvs. to 8 in. long, 7–9-foliolate, dull green, pubescent beneath: fls. 1 or few, large, pink: fr. pyriform. Himal. Not hardy north.—*R. micrántha*, Smith (VI). Allied to R. rubiginosa. With hooked prickles, without bristles: lfts. slightly pubescent beneath: fls. pale pink, small; styles slightly exserted, glabrous. Eu., N. Afr., W. Asia.—*R. microcárpa*, Lindl. (R. Indica, Linn., not Lindl.) (I). Branches slender, with scattered, hooked spines: lfts. 3–7, ovate-lanceolate; stipules almost free: fls. corymbose, small, white: fr. small, globose; sepals deciduous. China.—*R. microcárpa*, Hort. = multiflora.—*R. montàna*, Chaix. (VI). Allied to R. canina. Of vigorous growth, with strong spines: lfts. broader, tinged reddish: fls. pink; pedicels and receptacle glandular-hispid. S. Eu., N. Afr.—*R. orientàlis*, Dup. (VI). Allied to R. rubiginosa. Dwarf: prickles slender, subulate: lfts. 5–7, simply serrate, pubescent on both sides: fls. pink, solitary, short-pedicelled. W. Asia.—*R. Phœnícia*, Boiss. (I). Allied to R. moschata. Lfts. usually 5, obtuse or acute: corymbs usually many-fld., pyramidal; styles glabrous. Asia Minor.—*R. platyacántha*, Schrank = R. xanthina.—*R. sèpium*, Thuill. = R. agrestis.—*R. Sonoménsis*, Greene (VIII). Allied to R. Californica. Low shrub, to 1 ft., with straight prickles: lfts. broadly ovate, doubly glandular-serrate: fls. small, in dense corymbs. Calif.—*R. spithàmea*, Wats. (VIII). Allied to R. Californica. Stems usually not over ½ ft. high, sparingly branched: lfts. doubly glandular-serrate: fls. usually solitary. Calif.—*R. tomentòsa*, Smith (VI). Allied to R. villosa. Stems slender, often arching: prickles often slightly curved: lfts. smaller, grayish green: fls. pale rose, on longer pedicels: fr. smaller, with the sepals upright-spreading, caducous at maturity. Eu.—*R. Webbiàna*, Wall. (VIII). Erect shrub, with prickly stems: lfts. 5–9, very small, orbicular or oblong, usually glabrous: fls. mostly solitary, pink, large: fr. ovoid. Himal. to Afghan. and Turkestan.—*R. xanthìna*, Lindl. (XI). Rigid shrub to 4 ft., with stout, straight prickles: lfts. very small, 5–9, glandular beneath: fls. solitary, golden yellow, 1 in. across. Afghan. to N. China. B.M. 7666.

ALFRED REHDER.

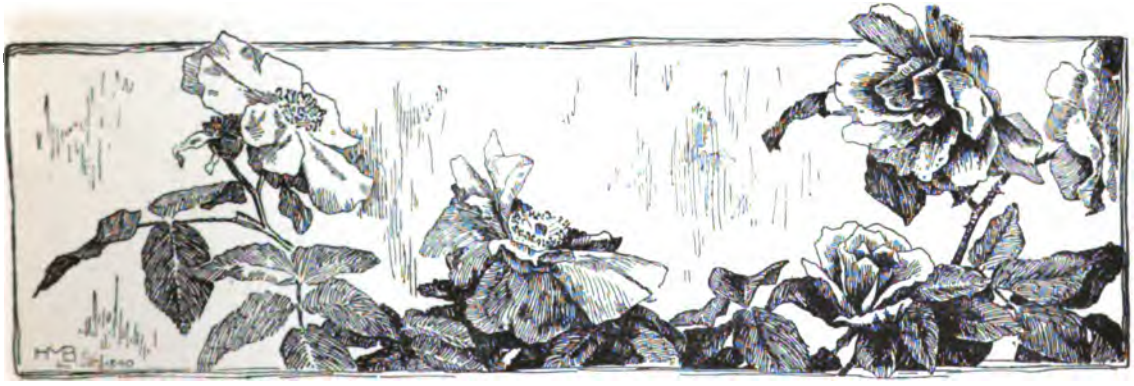
ROSANÒWIA. See *Sinningia*.

ROSCHÈRIA (name unexplained). *Palmàceæ.* A genus of one species, a palm from Seychelles allied to Hyophorbe, which see for differences. It is slender, erect, spiny at the nodes: lvs. terminal, long-petioled, at first 2-fid, later unequally pinnatisect; segments numerous, linear-lanceolate, 2-fid at the apex, the numerous nerves scaly beneath; petiole spineless, somewhat 3-sided, concave above; sheath long, prickly; spadix 2–6 ft. long: peduncle long, slender, compressed; branches slender, rather simple, divaricate: spathes many, entire, narrowed, compressed, naked, the 2 lower ones persistent, the upper deciduous: fls. pale: fr. fusiform, small, black.

melanochætes, Wendl. (*Verschaffèltia melanochætes*, Wendl.). Trunk 15–25 ft. high, 2–3 in. in diam., with many aërial roots, and when young with a ring of spines below each leaf-scar: lvs. 4½–7 ft. long; petiole 1½–2½ ft. long, smooth, with a pale band running from the top of the sheath down the back of the petiole; sheath 1½–2½ ft. long, with a few fine black spines; leaf-blade pale green, 3–5 ft. long, 2–3 ft. broad, entire when young, unequally pinnate; segments 1–1½ ft. long, 2-fid at the apex, clothed beneath with peltate scales. Seychelles. I.H. 18:54.

JARED G. SMITH.

ROSCÒEA (Wm. Roscoe, founder of the Liverpool Botanic Garden). *Scitaminàceæ.* A genus of 6 species of half-hardy perennial herbs from the Himalayas, with



2167. Rosa lævigata. Run wild in the South and known as Cherokee Rose. No. 49.

purple, blue or yellow fls. terminating the leafy stems. Lvs. lanceolate or oblong: fls. in terminal, usually few-fld. spikes; bracts persistent, 1-fld.; calyx long-tubular, slit down one side; corolla-tube slender, as long as calyx or longer; lateral segments spreading; lateral staminodes oblanceolate, petaloid; lip large, cuneate, deflexed, 2-cleft or emarginate.

purpùrea, Sm. Stem ½–1 ft. high, with 5–6 sessile, lanceolate, sheathing lvs. about 6 in. long: fls. few, purple, rarely lilac or white, in a sessile spike, appearing one at a time in midsummer. B.R. 27:61. B.M. 4630. L.B.C. 15:1404. G.C. III. 8:191.—The most hardy species of the genus. Var. **Sikkiménsis**, Hort. Elwes (*R. Sikkiménsis*, Van Tubergen), is said to differ in having the epiphytic habit and more numerous fls. of a different shade. Consult G.C. III. 8:221. F. W. Barclay.

ROSE (see also *Rosa*). The article Rose will probably be consulted oftener than any other in this Cyclopedia. Therefore, the subject is presented from many points of view, even at the risk of repetition. Every pains has been taken to procure reliable information and advice from specialists in the different parts of the subject. It has been said that the garden Rose does not thrive in North America as it does in Europe; but however true this may have been, it scarcely holds to-day. The success of the Rose in this country is very largely a question of the selection of adaptable varieties. These varieties are mostly the compounds of various types and species. In most garden Roses it is now impossible to trace the original species with accuracy. For horticultural purposes, a purely botanical classification is of minor consequence, although, in the main, the leading garden-groups follow old specific lines. For a garden classification that follows botanical lines closely, see Baker in Gardener's Chronicle, II. 24, p. 199 (1885).

The leading contemporaneous American text on the Rose is Ellwanger's. American Rose books are: "The Rose Manual," Robert Buist, Philadelphia, 1844, and later editions; "Manual of Roses," William Robert Prince, New York, 1846; "The Rose," Samuel Parsons, New York, 1847, and later editions; "American Rose Culturist," New York, 1856; "Book of Roses," Francis Parkman, Boston, 1866; "The Rose," Henry Shaw, St. Louis, 1882; "The Rose," H. B. Ellwanger, New York, 1882, 2d ed. 1892; "Secrets of Rose Culture," W. J. Hatton, Huntington, N. Y., 1891. For a list of Rose books in all languages, see "Bibliografia de la Rosa," by Vergara, Madrid, 1892.

Following are the equivalents of some of the common names of Roses:

Ayrshire	*R. arvensis*, var. *capreolata*
Banks Rose	*R. Banksiæ*.
Bengal	*R. Chinensis*.
Bourbon	*R. Borbonica*.
Champney	*R. Noisettiana*.
Cherokee	*R. lævigata*.
Cinnamon	*R. cinnamomea*.
Damask	*R. Damascena*.
Dog	*R. canina*.
Eglantine	*R. rubiginosa*.
Memorial	*R. Wichuraiana*.
Moss	*R. Gallica*, var. *muscosa*.
Musk	*R. moschata*.
Noisette	*R. Noisettiana*.
Prairie	*R. setigera*.
Provence	*R. Gallica*.
Scotch	*R. spinosissima*.
Sweetbrier	*R. rubiginosa*.
Tea	*R. Chinensis*, var. *fragrans*.

L. H. B.

Horticultural Classification of Roses.—The garden classification of Roses presents considerable difficulty, as the several groups have been so much mixed that the original characteristics of each overlap at nearly all points. This is particularly true of the Perpetuals, of which any close classification is impossible. The difficulties increase as one advances. Certain clear-cut characters may be taken to mark certain distinct groups in the summer Roses, with which the horticulturist has not busied himself so much. Nearly all of these characters are reproduced in the Perpetuals, and, being blended together, give rise to endless confusion; thus the following scheme is merely suggestive and should be studied in comparison with the botanical classification (see page 1548).

American Rose culture, so far as garden varieties are concerned, can hardly be said to have found itself as yet. Our growers are to-day striving to overcome the short-lived character of the blooms, so as to import into our gardens something of the Rose beauty of Europe. The Wichuraiana, Rugosa, and Multiflora Roses, combined with our native species and blended again with the best representatives of the garden groups already grown, seem to offer the solution. The beginning has already been made. The hot sun and trying climatic conditions of our summers are fatal to the full beauties of the Roses of France and England. The flower is developed so quickly that it has no opportunity to "build" itself; and once developed it fades as rapidly. What has been done for other florists' flowers remains yet to be accomplished for the Rose, and the American Rose of the future will have to be developed to suit the circumstances in the same way that the American carnation has been produced. A special society has been formed to foster this work and is now in its third year of existence.

Class I. Summer-flowering Roses, blooming once only.

A. *Large-flowered (double).*	
B. *Growth branching or pendulous: leaf wrinkled*	1. *Provence* Moss Pompon Sulphurea
BB. *Growth firm and robust: leaf downy*	2. *Damask* and *French* Hybrid French Hybrid Provence Hybrid Bourbon Hybrid China
BBB. *Growth free: leaf whitish above, spineless*	3. *Alba*
AA. *Small flowered (single and double).*	
B. *Growth climbing: fls. produced singly*	4. *Ayrshire*
BB. *Growth short-jointed, generally, except in Alpine*	5. *Briers* Austrian Scotch Sweet Penzance Prairie Alpine
BBB. *Growth climbing: fls. in clusters*	6. *Multiflora* Polyantha
BBBB. *Growth free: foliage persistent (more or less, shiny*	7. *Evergreen* Sempervirens Wichuraiana Cherokee Banksian
BBBBB. *Growth free; foliage wrinkled*	8. *Pompon*

Class II. Summer- and autumn-flowering Roses, blooming more or less continuously.

A. *Large-flowered.*	
B. *Foliage very rough*	9. *Hybrid Perpetual* 10. *Hybrid Tea* 11. *Moss*
BB. *Foliage rough*	12. *Bourbon* 13. *Bourbon Perpetual*
BBB. *Foliage smooth*	14. *China* Tea Lawrenceana (Fairy)

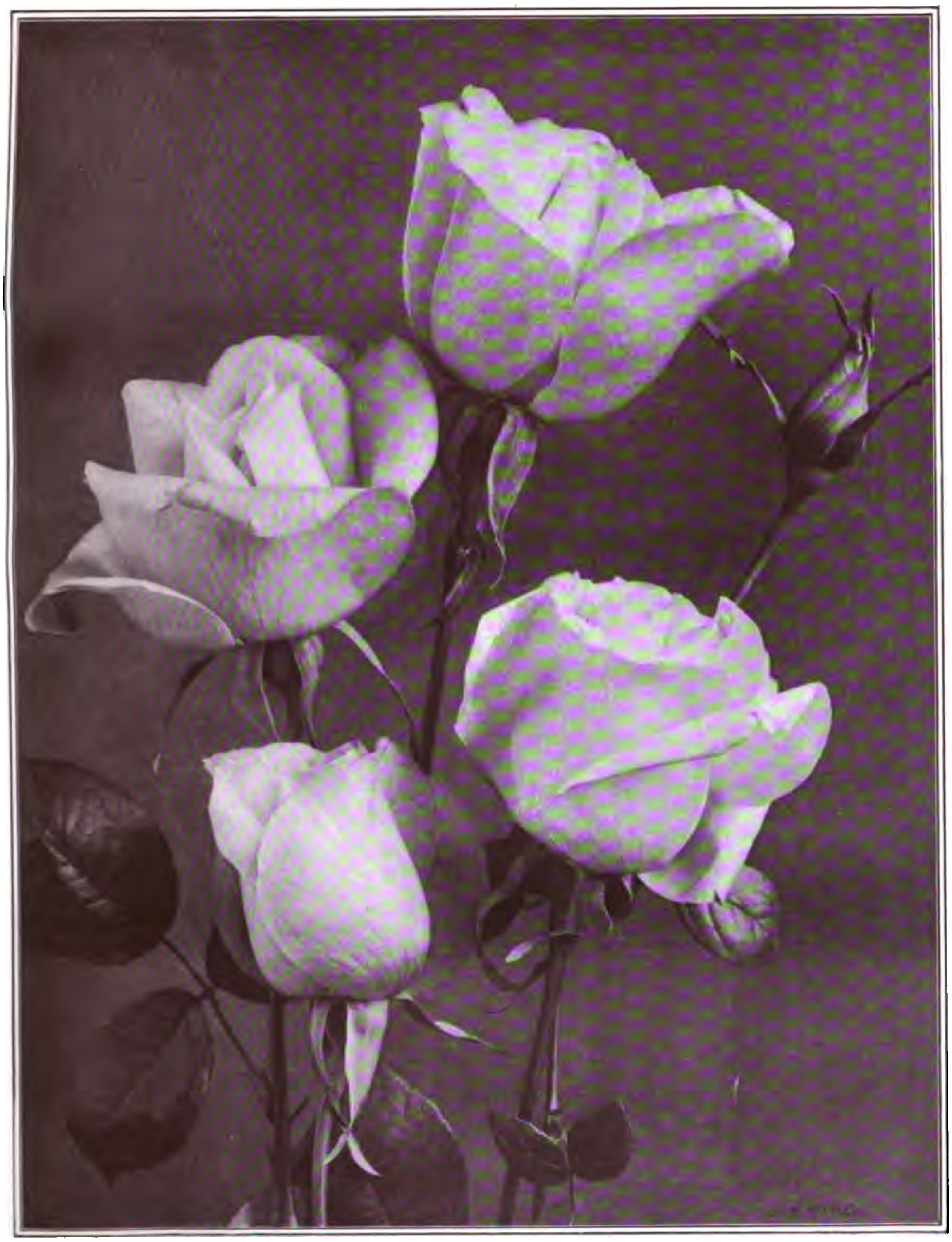


Plate XXXV. A Tea Rose.—Bridesmaid.

AA. *Smaller flowered.*
B. *Foliage deciduous.*
C. *Habit climbing* ....15. *Musk*
Noisette
16. *Ayrshire*
17. *Polyantha*
Wichuraiana Hybrids
CC. *Habit dwarf, bushy*.18. *Perpetual Briers*
Rugosa
Lucida
Microphylla
Berberidifolia
Scotch
BB. *Foliage more or less persistent* ....19. *Evergreen*
Macartney
Wichuraiana

Garden-group 1. *Provence.* Fragrant: branching or pendulous: fls. generally globular: foliage bold, broad, wrinkled, deeply serrate: prickles uncertain; sometimes fine and straight, sometimes coarse and hooked. Rich soil. Prune closely unless very vigorous. Types are Moss Rose, a crested form of the Provence (Fig. 2157). Pompon, a dwarf group; cupped flowers. See also No. 8. Sulphurea, an undesirable yellow form of difficult cultivation.

Garden-group 2. *The Damask and French.* Damask Roses are fragrant: growth robust; spinous: lvs. light green, downy, coriaceous. Hardy: free-flowering: scent destroyed on drying.

French Roses: Fragrant (moderately): more upright and compact in growth than the Provence: prickles smaller and fewer: fls. generally flat. Very hardy, growing in any soil; petals bleach in strong sunlight; makes abundance of wood, which should be thinned out; perfume develops in the dried petals.

Hybrid French or Hybrid Provence, a less robust group with smoother, short-jointed wood and generally light-colored flowers. Type Princess Clementine. Other subdivisions include hybrids with nearly all of the Perpetual group. Madame Plantier is a Hybrid Noisette. Coupe d'Hebe is a Hybrid Bourbon.

Hybrid China (China × French and Provence, partaking more of those parents). Growth more diffuse than the French Rose; foliage smooth, shining and remains on the bush late in the year; thorns numerous and strong. Vigorous of growth; very hardy, and generally well adapted to poor soil; requires but little pruning.

Garden-group 3. *Alba, or White Roses.* A very distinct group; all light-colored flowers of moderate size: leaf whitish above, deep green below: spineless (some hybrids with other groups are very thorny), of free growth; prune closely. Type, Felecite Parmentier and Maiden's Blush.

2168. American Beauty Rose (× ¼).
Probably the most famous Rose now cultivated in America. One of the Hybrid Perpetual class.

Garden-group 4. *Ayrshire.* Climbing Roses; very hardy: slender shoots suitable for trellises and trunks of trees: fls. produced singly. Useful for pot cultivation when trained over a frame; fls. vary from white to deep crimson. Type, Queen of the Belgians, Dundee Rambler. Ruga is a hybrid between this group and one of the Teas; fragrant.

2169. Paul Neyron (× ⅙).
A popular rose-colored variety of the Hybrid Perpetual type.

Garden-group 5. *Briers.* Under this heading may be grouped most of the well-defined types of garden Roses, mostly small-flowered and which do not readily respond to high cultivation. They are more useful as flowering shrubs in the garden than for cut-flowers. The blooms are generally short-lived.

Austrian or Yellow Briers. Small leaflets: solitary flowers: bark chocolate-brown. Very hardy, but require pure air and dry soil; will stand very little pruning, producing flowers from the upper ends of the old wood. Types, Harisoni, Austrian Copper and Persian Yellow.

Scotch or Spiny. This group is well recognized by its excessive spininess; the spines are also very sharp: compact, low bushes, flowering abundantly and early: flowers small, double. Multiply by underground suckers; fragrant. One hybrid of this group, Stanwell, is a Perpetual.

Sweetbrier. Distinguished by the fragrance of its leaves: the fruits are also decorative: foliage small: flowers light-colored generally and not held of much account.

Lord Penzance Briers. This is a group of hybrids of *R. rubiginosa* (the Sweetbrier), and the older large-flowered varieties, especially Bourbon and Damask. The results are hardly distributed in America as yet; a few are to be found in select collections. Generally speaking they may be described as very greatly improved Sweetbriers. Brenda is particularly desirable for its fruit.

Prairie Rose (*R. setigera*). A native species; promises under cultivation to develop some valuable acquisitions, especially in hybridization with other groups: Type, Baltimore Belle. Fig. 2154.

Alpine or Boursault. Native of the Swiss Alps; semi-pendulous, long, flexible, smooth shoots: flowers in large clusters: mostly purple or crimson flowers. Good for pillars, very hardy, especially suitable for shady places; should be well thinned in pruning, but the flowering wood left alone: type Amadis. Produced by crossing Teas and *R. alpina*.

Garden-group 6. *Multiflora*. The Multiflora group divides itself naturally into the Multiflora true and Polyantha. *R. multiflora*, the parent type, is characteristic of the varieties here, the flowers being produced in large corymbs and continuing over a comparatively long time. This group is particularly well adapted to the wild garden. There are many hybrids, which are known in cultivation under the general term of Rambler Roses.

2170. La France, a famous Hybrid Tea Rose (× ⅓).
This picture was made from the White La France. The original La France is pink.

The Polyantha section has given a fairly hardy variety in Crimson Rambler. Useful as pillar and trellis Roses and respond to high cultivation. In pruning remove only the old canes, leaving the young new growth to carry flowers next year. Some cluster Roses of the Indica or Tea alliance popularly called Polyanthas do not belong here.

Garden-group 7. *Evergreen*. The so-called Evergreen Roses hold their foliage until very late in the year and in hybridization appear likely to yield varieties which are practically evergreen.

Sempervirens, useful as pillar Roses, producing flowers in corymbs: very hardy: vigorous growth: free bloomer: requires considerable thinning in pruning. Types, Felicite perpetuella.

Wichuraiana (Fig. 2155), most popular of all the rampant Roses: very hardy: growing in any soil: this promises to be the basis of a very valuable race of American Roses: flowers in the type white. Hybrids have been raised from Hybrid Perpetual and Tea varieties giving large flowers, scented; such are Gardenia and Jersey Beauty. Several hybridists are now working on this species, and he next few years promise remarkable developments. W. A. Manda in New Jersey, M. H. Walsh in Massachusetts and M. Horvath in Ohio are thus engaged.

Cherokee (*R. lævigata*) of the southern states can be grown satisfactorily away from its native regions only in a greenhouse. Figs. 2152–4.

The Banksian (*R. Banksiæ*). Two varieties of this are known, the yellow and the white. Requires greenhouse treatment: evergreen: needs very little pruning, merely shortening the shoots that have bloomed. Yellow variety scentless, white variety possessing the odor of violets: flowers are produced in graceful drooping clusters.

Garden-group 8. *Pompon*. A small-flowered Provence Rose. See No. 1.

Garden-group 9. *Hybrid Perpetual, or Hybrid Remontant*. A large and comprehensive group of much-mixed origin. The mixture with other groups has become so involved as to render separation practically impossible. The characteristics may be described as stiff, upright growth, sometimes inclined to pendulous: fls. of all types: foliage dull green, wrinkled, not shiny: embracing generally the characteristics of the Provence, Damask, French and the Chinese groups: fls. large, inclined to flat, generally of dark colors. By far the largest and most comprehensive division. Figs. 2168–9.

Garden-group 10. *Hybrid Teas* form a section of the Hybrid Perpetual group crossed back on to the Tea-scented China, gradually losing all identity. They differ from the pure Hybrid Perpetuals by having foliage of a deeper green and less wrinkled. Some of the best forcing Roses are in this group, which promises the greatest development for American rosarians; Robert Scott is a type of this class and is raised from Merveille de Lyon, H. P., and Belle Siebrecht Hybrid Tea. The La France type belongs here. Fig. 2170.

Garden-group 11. *Moss*. A perpetual flowering group of the Provence. See Summer Roses and Fig. 2157.

Garden-group 12. *Bourbon*. Dwarf and compact growth, with rounded, more or less shining leaflets: very floriferous: brilliant colors: good outline: in perfection late in the season: requires close pruning. Type, Hermosa (or Armosa).

Garden-group 13. *Bourbon Perpetual*. Very floriferous: flowers moderate-sized, well formed, in clusters. Type, Madame Isaac Pereire.

Garden-group 14. *China*. The China or Monthly Rose is characterized by its positively perpetual manner of flower. Its blooms become much darkened in color from the action of the sun's rays: fls. small and irregular in shape. Somewhat tender. Chiefly interesting as the parent of the true Teas.

The Tea-scented China or Tea Rose. Fig. 2171. Large, thick petals, with the characteristic tea scent: flowers generally light colored, pink and creamy yellow: growth free; the best for forcing. The group has been hybridized with all other sections and the Tea influence is seen throughout the Rose family. Some of the varieties are climbing. Type, Bon Silene and Homer.

Lawrenciana. Dwarf forms, requiring the same treatment as the Teas. Commonly known as the Fairy Rose.

Garden group 15. *The Musk*. Very fragrant: rather tender: derived from *Rosa moschata*: fls. of pale color. This group has been much hybridized with others, and its identity is lost as a garden plant in that of its derivatives, especially the Noisette. The flower buds are elongated and the flowers produced in clusters.

Noisette. Fig. 2172. Larger flowered than the true Musk Roses: flowering very late: free growth: more hardy. The group bears a certain superficial resemblance to the Teas and requires moderate pruning; will grow in any soil. This sub-group has been largely blended with the Teas and with a loss of hardiness. In consequence it has fallen into disuse.

Garden-group 16. *Ayrshire*. Perpetual forms of the Ayrshire. For characters, See Summer Roses.

Garden-group 17. ***Polyantha.*** Perpetual-flowering varieties of the Multiflora group. The term in gardens is taken to include a large number of small cluster-flowered, climbing Roses, and is particularly important in American Rose culture, as the basis of a new section of hybrids with the Teas and (erroneously) including hybrids of Wichuraiana and Teas. M. H. Walsh in Massachusetts, M. Horvath in Ohio, and Jackson Dawson in Massachusetts have accomplished important work in this field. Some of Walsh's recent introductions, as Débutante and Sweetheart, not as yet fairly tried, and the Dawson Rose may be classed here. They are valuable as trellis and pillar Roses for garden decoration.

Garden-group 18. *Perpetual Briers.* Of this group there are about five important types.

Rugosa or Japan Rose, a low-growing bush: hardy: useful as a hedge plant, and specially adapted for exposed situations near the seashore. Figs. 2162–4. Hybrids have been made with other Perpetual groups, especially Teas and H. P's. Mme. Georges Bruant is a type. The Rugosa blood is strongly seen in all cases.

Lucida, a small insignificant group, having some connection with the Macartney.

Microphylla has minute leaflets.

Berberidifolia has leaves somewhat resembling barberry.

Perpetual Scotch, a perpetual-flowering form of ***Rosa spinosissima***, probably a hybrid from the Damask.

Garden-group 19. *Evergreen.* Two types, as follows:

Macartney, slender: sweetly scented and very floriferous throughout the season. Is derived from *R. bracteata*.

Wichuraiana. The Wichuraiana hybrids already referred to in the Polyantha group may dubiously be included here. They have not yet been sufficiently tested

LEONARD BARRON.

Rose Gardens for Rose Lovers.—The Hybrid Perpetual or Hybrid Remontant Rose (hybrids of *Rosa Damascena*, *Borbonica*, etc.) is the largest and most important group of hardy Roses. The common varieties are crosses of Provence and Damask Roses upon Bourbons, Bengals and Teas, and vice versa. Of all Roses, Hybrid Perpetuals, in regions of severe winters, offer the amateur the greatest promise of success.

A warm sunny spot shielded from strong or bleak winds should be chosen for the Rose garden. A piece of woods or a hedge offer good protection if they are far enough away from the bushes so that they do not shade them or rob them of nourishment. Dean Hole says, "The Rose garden must not be in an exposed situation. It must have shelter, but it must not have shade. No boughs may darken, no drip may saturate, no roots may rob the Rose." A hillside is less exposed to late frosts than valley and is therefore better. The ground must be well drained. If nature has not provided such a spot the Rose-grower must make one.

The ideal soil for the Hybrid Perpetual Rose is a strong rich clay or loam. Though Tea Roses sometimes do well in gravel or sandy soil, Hybrid Perpetuals never do. The ground should be spaded up to a good depth and all stones, grass and roots carefully removed.

Late autumn is the best time for setting out hardy Roses. The writer has set out over a hundred Hybrid Perpetuals and Hybrid Teas when he was compelled to shovel away several inches of snow and break up the frozen crust of the earth with crow-bar and pick-ax before he could dig the trench in which he planted them, and yet he did not lose one of them. Put out late in the fall with the earth well firmed around them and properly protected, hardy and half-hardy Roses are almost sure to come through the winter all right and make a good bloom the first summer. In no other way can Roses be set out so quickly and so well as in a trench dug the proper depth and width. Budded plants should be set so that the joints will be three inches under the surface of the ground. This is the only way to secure immunity from suckers growing from the root into which the bush has been budded. The best fertilizer for Roses is rotted cow manure. The next in value is the manure from the pig-sty.

Nearly all of the Hybrid Perpetuals and Mosses will stand the severe winters in the northern states without protection, but it is best to protect them. All Bourbon, Hybrid Noisette, Hybrid China and Hybrid Teas in the northern, and in some of the middle states, must be protected; "excelsior" tied around the bushes to the height of 12 or 15 inches gives sufficient protection.

When the leaves are out and the buds well formed a mixture composed of three parts of wheat flour and one of white hellebore sprinkled on the foliage when wet after a rain or dew disposes of the most dangerous foes of the Hybrid Perpetual. The dew and flour make a paste that holds the hellebore on till its work is done. A tea made of tobacco stems will destroy the insects most troublesome in July and August. Trimming should be done in the spring before the sap begins to flow.

The following embrace the best of the Hybrid Perpetuals: Alfred Colomb, Anne de Diesbach, Baron de Bonstetten, Baroness Rothschild, Clio, Earl of Dufferin, Fisher Holmes, Francois Michelon, Gloire de Margottin, Gen. Jacqueminot, Gustave Piganeau, Heinrich Schultheis, Jean Liabaud, Jeannie Dickson, Jubilee, La Rosiere, Louis Van Houtte, Mabel Morrison, Mme. Gabriel Luizet, Marchioness of Lorne, Margaret Dickson, Marie Baumann, Marshall P. Wilder, Mrs. John Laing, Pierre Notting, Prince Camille de Rohan, Queen of Queens, Xavier Olibo, Paul Neyron, Ulrich Brunner.

2171. Yellow Tea Rose, Madame Honore Defresne, popular in the South (× ⅓).

The Moss Rose (*Rosa Gallica*, var. *muscosa*) is a universal favorite. The best varieties are Crested, Gracilis and Common Moss. Fig. 2157. Seven leaflets are found on most of them. They must be closely pruned.

The Perpetual Moss Rose (*Rosa Gallica*, var. *muscosa*): These are like the Moss Roses except that they are autumnal bearers. Mme. Edward Ory, Salet and Soupert-et-Notting are the best of this class. The best results can be secured only by close pruning.

Sweetbrier (*Rosa rubiginosa*): Eglantine is a name given to a Rose found in a wild state in various countries. One variety known as Common Sweetbrier, a native of England, is prized wherever known. It owes its popularity not to its flower but to the perfume of its foliage. The attempts made to develop the flower and still retain the fragrance of its foliage have not yet been successful. No better Rose can be found for hedge-making.

Austrian Brier (*Rosa Eglanteria*): This Rose has 7 or 9 leaflets and single flowers of a coppery yellow color. It is so hardy that it can brave the most rigorous climate where man tills the soil. Persian Yellow, Harisonii and Copper are the most valuable varieties. They should be pruned sparingly.

Hybrid Climbing Roses. These are especially useful as pillar Roses. The most valuable are Climbing Jules Margottin (See Fig. 2179, page 1567) and Glory of Cheshunt.

The Prairie Rose (*Rosa setigera*) is the hardiest of climbers. This quality, with the rapidity and vigor of growth, has given them a wider popularity than any other climbers. The Gem of the Prairie is the only fragrant Prairie Rose. Baltimore Belle (Fig. 2154) is the least hardy but most beautiful. Other valuable varieties are: Queen of the Prairie, Anna Marie and Triumphant. The pruning knife should be used sparingly.

Hybrid China Rose (*Rosa Chinensis* forms): Many Roses catalogued as Hybrid Perpetuals properly belong here. If Ellwanger's suggestion that all French, Provence, Damask and Hybrid Bourbon be grouped under the Hybrid Chinas is adopted, Rose classification will be much simplified and little will be lost in accuracy. Madame Plantier is the best known and most valuable of all the group.

Half-hardy Roses: Bourbon Rose (*Rosa Bourbonica*): This group for the most part is composed of autumnal bloomers. They are popular as garden Roses. Hermosa is the freest bloomer. Appoline is the most beautiful. George Peabody and Malmaison are also deservedly popular. The moderate growers of this group should be closely pruned.

The Hybrid Noisette (*Rosa Noisettiana*, var. *hybrida*) has made several contributions to the rosarian. The least hardy but the most beautiful members of this group are Madame Noman, Mlle. Bonnaire and Eliza Boelle. Rivals in beauty and more hardy are Coquette des Alpes, Coquette des Blanches. The pruning knife should not be spared with this class.

The Hybrid Tea Rose (*Rosa Chinensis*, various forms) is more hardy than the Tea Rose and less hardy than the Hybrid Remontants. It is a group destined to have many additions in the not distant future. La France, Captain Christy, Kaiserin Auguste Victoria, Caroline Testout and Liberty are the best of this class.

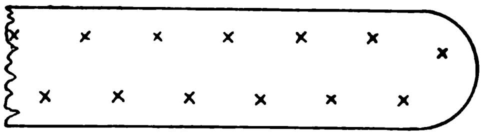
Some persons like to train Roses to a few canes and tie them to stakes (Fig. 2173). Another practice is to bud them high on brier stocks and to grow them as standards. Most Americans prefer the free-growing bush, blooming from near the ground (Fig. 2174).

EDMUND M. MILLS.

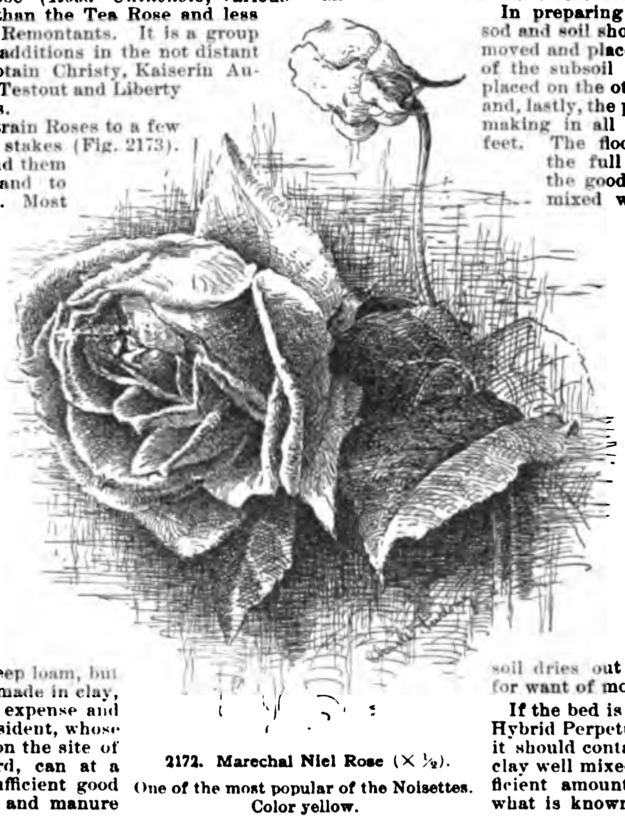
Another View of Garden Rose-Growing. Roses may be successfully grown in any soil that will produce fair crops of grain, vegetables or grass. Certainly the best results will be obtained in the more favorable soils and situations, but every one who loves a Rose and possesses a few feet of ground with plenty of sunshine can have his own Rose garden and find pleasure and health in cultivating the queen of flowers. Of course the ideal soil is a rich, deep loam, but a good Rose bed can be made in clay, sand or gravel at little expense and labor. Even the city resident, whose house has been erected on the site of an exhausted brick-yard, can at a small expense secure sufficient good soil from the outskirts and manure from the adjacent stables to make a Rose garden that will grow as good plants and flowers as those of his more favored friends who have acres at their disposal, provided always that the sunlight can reach the beds for at least half of the day.

The preparation of the ground is the first step of importance. Roses abhor wet feet, and if the soil is wet it must be thoroughly drained. This can be accomplished by digging out the bed to a depth of three feet and filling in one foot with broken stone, bricks, cinders or anything that will allow a free passage of the water through the soil. If this is not sufficient and the water is not carried away, provision must be made for this by tile-draining; but, except in very extreme cases, the drainage before mentioned will be found amply sufficient. The composition of the soil should depend on the class of Roses to be grown, for the Hybrid Remontants do best in a heavy soil containing clay, while those having Tea blood prefer a lighter, warmer soil.

The beds may be made of any desired shape, but a width of 4 ft. will usually be found the most satisfactory, as a double row can be planted at intervals of 2½ ft., which will be all that is necessary for the strongest growing varieties, and the blooms can be gathered from each side without the necessity of trampling on the soil. Space may be economized by planting as in the following diagram:



The plants will then be 1 ft. from the edge and 30 in. apart, and each plant will be fully exposed to the light and air and will not interfere with its neighbors.



2172. Marechal Niel Rose (× ½).

One of the most popular of the Noisettes. Color yellow.

In preparing a bed on a lawn, the sod and soil should first be entirely removed and placed apart; then the best of the subsoil may be taken out and placed on the other side of the trench, and, lastly, the portion to be discarded, making in all a depth of at least 2 feet. The floor is then loosened to the full depth of a pick-head, the good subsoil replaced and mixed with a generous dressing of well-decomposed stable manure; lastly the surface soil and sod well broken up and also thoroughly enriched with manure, and the bed filled to the level of the adjoining surface with enough good soil added to replace the discarded earth. When the bed has settled the surface should be at least one inch below that of the adjoining sod, in order that all the rainfall be retained. The writer believes it to be a serious mistake to make any flower bed higher than the adjacent surface, as in hot weather the soil dries out and the plants suffer for want of moisture.

If the bed is intended for the hardy Hybrid Perpetual or Remontant class, it should contain a fair proportion of clay well mixed with the soil. A sufficient amount is always present in what is known as a heavy loam. If the soil does not contain this naturally, it should be added and thoroughly incorporated with the other ingredients. If the bed is intended for Hybrid Teas, Teas, Bourbons or Noisettes, the soil should be lighter, and if naturally heavy should have added to it a proper amount of sand or leaf-mold, and be thoroughly mixed as before. Roses are rank feeders; therefore be liberal with manure for every class.

Garden Roses can be obtained from the dealers grown in two ways: on their own roots, and budded on the Manetti or brier stock. Figs. 2156, 2175. There is much difference of opinion as to the relative value of the two sorts, and it must be admitted that some of the stronger varieties will do equally well either way; but the opinion of the writer, based upon the experience of nearly a quarter of a century, is that all of the less vigorous varieties are far better budded than on their own roots, and some are utterly worthless unless budded: notably, Reine Marie Henriette and Viscountess Folkestone, both charming Roses when well grown. The budded plants are mostly grown in Europe, taken up as soon as the wood is ripened in the autumn, and shipped to us in the dormant state in time for planting in the latitude of Philadelphia before the ground is frozen. They are usually received in such excellent condition that rarely one in a hundred of the hardy sorts fails to make a good growth and a fair bloom in the following season.

2173. Rose trained to a few shoots. See p. 1564.

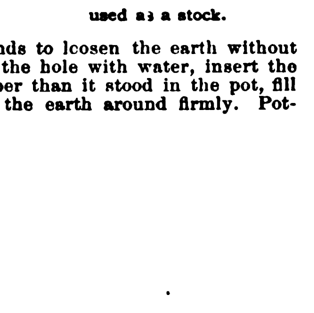
With the tender sorts, dormant planting out of doors in late autumn is attended with much risk, because of the inability of these plants to endure the rigors of our winters before becoming established. Consequently they need much more protection than the hardy varieties. It is really much better to have the planting deferred until the early spring, if the plants can be safely housed throughout the winter. After they have become successfully established their safety is assured, and they will repay in vigor and excellence the extra work expended upon them. Few amateurs, however, have the conveniences for caring for a number of plants under cover throughout the winter. Therefore they must take the risk of planting in the autumn or cultivate plants grown on their own roots. The best budded stock the writer has yet found was obtained from nurseries in Ireland, and it has been the uniform testimony of all who have examined them that they had not seen finer out-of-door Roses grown in this section. (For further discussions of budded and grafted Roses, see page 1574.)

Planting Budded Roses.—Holes at least 1 ft. in depth and 15 in. wide should be made for each plant, the collar or point where the bud was inserted and from which the new growth starts placed 2 in. beneath the surface of the soil, the roots spread out and downwards (care being taken that no roots cross each other) and all roots covered with fine soil free from lumps of manure. Fig. 2176. Manure should never be placed in actual contact with the roots, but near at hand, where the new feeding roots can easily reach when growth begins. The remaining soil should then be packed in firmly, the surface leveled and covered with about 3 inches of coarse litter and manure, and the long wood cut back to about 18 inches to prevent the plant being whipped and loosened by high winds. This extra wood is left to encourage root action in the spring and should be cut back to three or four eyes as soon as they can be detected when pushing out. Always cut above and close to a strong outside bud, without injuring it, to develop an open and free head, thus admitting light and air. If the uppermost bud is on the inside surface of the shoot, the new growth will be directed inward, dwarfing and hampering the plant and preventing proper development. The deep planting above described is necessary to prevent suckers from being thrown out by the roots, as these will speedily choke and kill the less vigorous wood which we are endeavoring to develop. From the writer's point of view the only objection to budded plants is this danger of suckering from the roots; therefore no one should attempt to cultivate budded Roses who cannot distinguish the brier should it appear, or who is too careless or indifferent to dig down at once and cut the wild shoot clean off at the root, rubbing it smooth to prevent its starting again. Do this just as soon as you discover it.

2174. A Rose bush for the corner of the garden.

A very little experience will enable any one to distinguish the brier. The canes are covered with minute thorns and bear seven leaflets, instead of the usual number of five. Should any doubt remain, follow the shoot down through the ground and if it starts below the collar, it is a brier. Remove it. These wild shoots usually appear a few inches outside of the regular growth, rarely inside; consequently there is little difficulty in detecting and removing them.

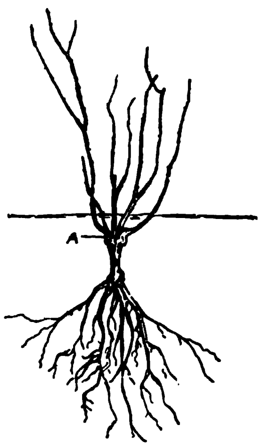
Planting Roses from Pots.—Should Roses grown on their own roots be preferred, they should be planted as soon as the spring weather has fairly settled and all danger of frost is over, that the plants may be firmly established before the heat of summer. Roses planted late in the season never do well, as they cannot attain sufficient vigor to withstand the burning heat of our summer sun. The holes need only be made a little larger than the pot in which the plant is growing. Choose a cloudy day, or the time just before a rain, or late in the afternoon, and, after making the hole, knock the pot off by inverting the plant and striking the edge sharply on a firm substance (the handle of a spade which has been firmly placed in the ground in an upright position will answer nicely). Press the ball of earth firmly between the hands to loosen the earth without injuring the roots, fill the hole with water, insert the plant a very little deeper than it stood in the pot, fill in with soil and pack the earth around firmly. Pot-


2175. Flower of the Manetti Rose, used as a stock.

grown plants will always require staking if the varieties are of upright growth.

Tea Roses.—Where the climate is too cold to winter out Tea Roses successfully, a charming effect can be obtained by planting in a bed 6 ft. in width, the rows one foot from the edge and 2 ft. apart, and the bed of any desired length or any multiple of 3 ft. A sectional frame made from tongued and grooved white pine fencing, 2½ ft. in height at the back and 2 ft. in front, facing east or southeast and fastened together with hooks and eyes or screws, the whole covered with ordinary coldframe sash (6 x 3 ft.), will preserve the tender varieties through a severe winter. The sash should be freely opened when the temperature is above 30° F. and air admitted during the day when it is 10 or 15° lower. Always close before sunset and open as soon as the sun shines each morning. Opening the sash to keep the plants cool and prevent growth is just as essential as covering to protect from cold, if abundance of flowers is desired. A few days' neglect in opening the sash when the temperature is above 30° will destroy most of the buds for the coming June, as they will be forced out, and one cold night will kill them. Protect from rains or snows, and do not water. Sufficient moisture reaches the roots from the outside to keep the plants in a healthy condition.

The writer has a number of Teas that have been grown successfully in such a bed for many years. They give hundreds of fine blooms from May until November and remain so vigorous that many of the new shoots are half an inch in diameter.



2176. A typical dormant Rose as it should be planted.
A, point where bud was inserted.

Climbing Roses.—These make a very effective background, and if trained on a high wire fence give a beautiful display. The strong-growing varieties should be planted 8 ft. apart and will each easily fill a trellis 9 ft. high. They also look well trained on the house porch, but are much more likely to be attacked by insect enemies there than when planted in the open, where the birds have free access to them, with no fear of disturbance. The birds will not do good work where they are in constant danger of interruption, so Roses grown on porches are usually attacked by aphides and slugs, the leaves becoming riddled and skeletonized, which rarely occurs when they are planted in the open.

If Roses are wanted around porches the Microphyllæ, white and pink, and the Crimson Rambler can be safely planted, as they are not attacked by the slug, but the blooms do not compare favorably with many other Roses of their habit. The other varieties can also be grown around porches, provided that they can be planted where the drippings from the roof will not fall upon them and they are kept free from slugs. This can be accomplished by free syringing with the hellebore infusion to be described later on.

Only a few of the climbing Teas can be grown successfully in the latitude of Philadelphia. Many of the finer varieties are worthless here, in spite of all the protection that can be given them, unless they are covered with glass. Lamarque, Bouquet d'Or, Cloth of Gold, Triomphe de Rennes, Maréchal Niel and Rêve d'Or have, in the writer's experience, all perished in the first winter, but Reine Marie Henriette, Gloire de Dijon, William Allen Richardson and Celine Forestier will do well and yield satisfactory results. The finest climbing Tea for this latitude is Reine Marie Henriette. It blooms finely and makes a magnificent growth, as may be seen in Fig. 2177. The trellis is 10 ft. wide and 9 ft. high.

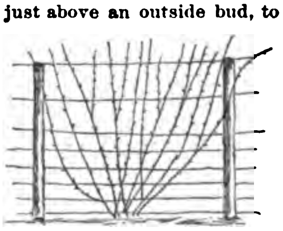
These varieties should be pruned sparingly by simply shortening-in the too vigorous shoots and cutting the laterals back to two eyes. Tie all to the trellis in a fan shape, dividing the space as evenly as possible. Fig. 2178 shows the same Reine Marie Henriette pruned and trained on trellis. These continue in flower until November, the early bloom in June being the finest, but many good Roses may be gathered throughout the summer and autumn. With the hardy June-flowering varieties the writer has not had much experience and can only recommend Crimson Rambler and Cheshunt Hybrid from actual observation. Both of these are effective in their masses of bloom for about three weeks in each year. Space has been so precious in the garden from which these notes were made that only the most satisfactory varieties were cultivated, and such kinds as Baltimore Belle and Prairie Queen do not compare favorably with others that occupy no more room and give much more gratifying results.

2177. Reine Marie Henriette, the finest climbing Tea Rose for the latitude of Philadelphia.

This shows the vigorous growth, the trellis being 10 feet wide and 9 feet high.

Hybrid Sweetbriers.—The recent introduction of the Marquis of Penzance Hybrid Sweetbriers is a valuable addition to our collection. All of the 16 varieties given in the accompanying list are desirable. The foliage is abundant, healthy, vigorous and fragrant, and the exquisite shading of each variety forms a beautiful contrast with the others. It would be difficult to choose among them, for all are worthy of a place in any garden where there is sufficient space for them to revel. They should have a high trellis and be planted fully 8 ft. apart. The only pruning necessary is to shorten back over-vigorous growth and occasionally remove some of the oldest shoots to prevent overcrowding.

Pruning the dwarf-growing Hybrid Perpetuals may be commenced late in March and can be regulated by the quantity or quality of the blooms desired. If the effect of large masses be wanted, 4 or 5 canes may be left 3 ft. in height and all very old or weak growth entirely removed. This will give a large number of flowers, effective in the mass but small and with short, weak footstalks scarcely able to support the weight of the heads and not effective as cut-flowers, as this sort of pruning is entirely for outside show. After the bloom is entirely over, the long shoots should be shortened back, that the plant may make good and vigorous wood for the next season of bloom. But if quality be desired, all weak growth should be removed, every remaining healthy cane retained and cut back to 6 or 8 inches. Always cut just above an outside bud, to make an open head that will admit light and air freely. After the first season's growth, there may be about three canes to be retained, but with good care and cultivation the number will increase yearly, until after 15 or 20 years there will be at least as many canes to be utilized. The writer has a bed over 20 years from planting, in which each plant, after close pruning, will measure from 15–18 inches in diameter, each cane throwing up from four to six shoots 1 or 2 ft. in length and sufficiently vigorous in most varieties to hold up the largest flowers and to give magnificent specimen flowers for cutting. Roses grown in this way do not



2178. Illustrating the pruning of the Rose shown in Fig. 2177.

need stakes. They are sufficiently strong and vigorous to hold erect any weight they may be called upon to bear; but late in the autumn, before the high gales of November arrive, they should be cut back to about 2 ft. to prevent their being whipped by the winds, for this would loosen the plant and break the newly-formed feeding roots. The plant should not be cut back to the point suggested for spring pruning, as in the hot Indian summer the upper eyes will surely be forced out and the promised blooms for the ensuing season destroyed; so in pruning for protection from November blasts, enough wood should be left to avoid all danger of the lower buds being forced out. The upper buds always develop earliest. Some varieties will not produce large footstalks under any method of treatment, notably Prince Camille de Rohan, La Rosarie and Rosieriste Jacobs; but almost all the other kinds do better under this method than any other, if quality is desired.

Pruning Dwarf-growing Tea Roses.—Tea Roses will not endure such vigorous cutting back as the Hybrid Remontants. All good strong shoots should be retained unless they form a very close head, when it is better to remove a few from the center. The canes should be shortened about one-third of their length, the branches cut back to 1 or 2 eyes, and after each period of bloom the longest shoots should be trimmed back sparingly. Bourbons need even less trimming. Souvenir de Malmaison, Mrs. Paul and others of this class should have only the weak ends of each shoot removed, and no more wood cut away than is necessary to remove weak and unhealthy portions; otherwise very few flowers will be produced.

Cultivation.—Just before growth commences in the spring, the surplus rough manure should be removed from the beds and all the remaining fine particles forked in. Deep cultivation is not desirable, as the roots are likely to be injured or broken. Three inches in depth is quite sufficient to cultivate a bed that has not been trampled upon, and this should be done with a 4-tined digging-fork, which is less likely to cause injury to roots than a spade. The beds should then be neatly edged and the surface raked off smooth and even. Frequent stirring of the surface with a sharp rake is all that is necessary afterwards, until the buds begin to develop. Then half a gallon of weak liquid manure applied around the roots of each plant just before a shower will be eagerly appreciated and assimilated. The manure water should be prepared beforehand, and as soon as a good promise of rain appears, all hands should be called into service and every plant given a full ration. One person should dig a shallow trench with a garden trowel around each plant, the next follow and fill with the liquid manure, being careful to avoid besmirching the leaves; afterwards the bed can be raked over level and the rain will wash the dainty food to the eager roots, and thrift and glory will result. This feeding may be repeated with benefit every week until the season of bloom is over, after which stimulation should cease and the plants be permitted to perfect the new wood for the next season's growth. Little pruning is necessary with "cut-backs." So much wood has been removed in gathering the blooms that but little more is left than is needed to keep the plants vigorous and healthy. There is another advantage from the system of close pruning: all growths are so strong and vigorous that they are better able to resist any inroads either of insects or disease. The greenfly seldom appears, but when detected may be readily kept down by repeated syringing with tobacco-water or Quassia infusion.

The belief that Roses exhaust the soil in a few years and require to be changed into new ground is generally accepted, and is true in most cases; but when beds are formed as previously described and budded Roses planted, the vigorous feeding roots find sufficient nutriment in their far-reaching growth to support a healthy development of wood and flowers for many years, especially if a generous top-dressing of manure be applied each autumn and liquid manure supplied liberally during the development of the buds. A top-dressing of wood ashes after the first spring cultivation will restore the potash to the soil and materially increase the vigor of the wood and flowers.

Insect Enemies.—The most formidable is the Rose beetle, which revels in the petals and buds of our choicest plants, usually selecting the light-colored varieties and working havoc and ruin wherever he appears. Hand-picking is the only effective remedy, and a quart can half filled with kerosene oil is a good place into which to drop the offender. He is easily caught when discovered, as he may readily be upon examination of each bud and flower.

The aphis or greenfly is found on the extreme ends of the shoots and young buds. This is the cow of the ants and is tended and milked by them. The aphis increases with enormous rapidity, and unless destroyed robs the plant of its vitality by sucking out the sap. A decoction of tobacco stems is made by half filling a barrel with refuse stems from a tobacco factory and filling the barrel with water. After this has been macerated, syringe the plants every day with the decoction until the enemy is defeated. In extreme cases, where the aphis has become firmly established, the remedy proposed by Mr. B. R. Cant, an English rosarian, may be required. He says: "Take four ounces of Quassia chips and boil them ten minutes in a gallon of soft water; strain it and while cooling dissolve in it four ounces of soft soap (or whale-oil soap). To this may be added another gallon or two of water. The plants should be syringed with this and all badly infested shoots dipped into it. Pure water should follow the next day to cleanse the shoots." If, at the first appearance of these pests, the finger and thumb are used to rub them off and destroy them, much subsequent trouble will be saved.

Slugs are usually found on the under side of the leaves and may be discovered by the skeletonized appearance of the leaf. To destroy them, make a decoction of powdered white hellebore, with one heaping tablespoonful to a pail (about four gallons) of boiling water. After cooling, apply with a syringe or, better, with a whisk broom. Push the top of the plant away with the left hand and, with the broom dipped in the solution, throw the drug up and against the leaves. One thorough application will usually suffice, but if the slug has appeared in previous years, anticipate his com-

2179. Climbing Jules Margottin (× ⅓).
One of the Hybrid Climbing Roses. See p. 1564.

ing and apply the hellebore solution before any mischief has been done and repeat later, should any evidences of his presence be detected. This aggressive offender is the larva of a small winged moth, and the presence of any insect of this sort in the vicinity of a Rose should always be regarded with suspicion.

The bark louse, or white scale, survives the winters and is usually found on old wood. It can best be treated before the growth begins in the spring. A solution of fifteen grains of corrosive sublimate to one pint of water, brushed over the stalks wherever the lice harbor, will speedily destroy all. As corrosive sublimate is a very powerful poison, great care should be taken in its use.

List of Roses that have been tested by the writer and can be recommended for gardens:

Hybrid Perpetual Roses.—Alfred Colomb, Alfred K. Williams, Annie Wood, Baroness Rothschild, Captain Hayward, Caroline d'Arden, Charles Lefebvre, Clio, Countess of Oxford, Dinsmore, Dr. Andry, Duke of Edinburgh, Duke of Teck, Etienne Levet, Eugenie Verdier, Fisher Holmes, François Michelon, General Jacqueminot, Giant of Battles, Heinrich Schultheis, Her Majesty, James Brownlow, Jeannie Dickson, John Hopper, James D. Paul, Lady Helen Stewart, Mabel Morrison, Madame Gabriel Luizet, Magna Charta, Marchioness of Lorne, Margaret Dickson, Marie Baumann, Marie Verdier, Merveille de Lyon, Mrs. John Laing, Mrs. R. G. Sharman Crawford, Paul Neyron (Fig. 2169), Pride of Waltham, Prince Arthur, Prince Camille de Rohan, Rosslyn, Rev. J. B. M. Camm, Suzanne Marie Rodocanachi, Ulrich Brunner, Xavier Olibo.

Hybrid Tea.—Augustine Guinoiseau, Captain Christy, Caroline Testout, Gloire Lyonnaise, Kaiserin Augusta Victoria, Madame Joseph Combet, Miss Ethel Richardson, Souvenir du President Carnot, Souvenir de Madame Eugenie Verdier, Viscountess Folkestone.

Mr. Alexander B. Scott recommends the following additional H. T. varieties: Antoine Rivoire, Baldwin, Bessie Brown, Gruss an Teplitz, Killarney, Lady Clanmorris, Madame Jules Grolez.

Tea-scented Roses.—Alphonse Karr, Comtesse Riza du Parc, Duchesse de Brabant, Etoile de Lyon, Francisca Kruger, Innocente Pirola, Isabella Sprunt, Madame Lambard, Madame Moreau, Maman Cochet, Madame Joseph Schwartz, Marie van Houtte, Papa Gontier, Safrano, Souvenir d'un Ami, The Queen, White Maman Cochet.

Moss Roses.—Comtesse de Murinais, Blanche Moreau, Crimson Globe, Laneii, Princess Adelaide.

Climbing Roses.—Crimson Rambler, Cheshunt Hybrid, Gloire de Dijon, Celine Forestier, Reine Marie Henriette, Pink Microphylla, White Microphylla, Madame Alfred Carriere.

2180. The old-fashioned yellow upright Rose (× ⅙).

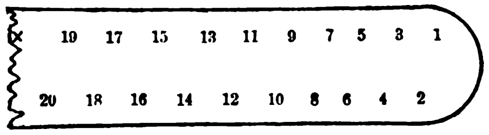
Hybrid Sweetbriers.—Amy Robsart, Annie of Geierstein, Brenda, Catherine Seyton, Edith Bellenden, Flora McIvor, Green Mantle, Jeannie Deans, Julie Mannering, Lady Penzance, Lord Penzance, Lucy Ashton, Lucy Bertram, Meg Merrilies, Minna, Rose Bradwardine.

The Hybrid Wichuraianas look promising, but have not been tested by the writer.

It is not intended that this list is by any means complete. There must be many good Roses that will do well under favorable conditions of which the writer has no personal knowledge. The collection is sufficiently large, however, for a beginning, and any one who has the time, energy and means may add to it, if he can bear disappointment cheerfully If one in a dozen of the highly lauded varieties in the dealers' catalogues prove satisfactory, the experimenter should be well satisfied. He can dig out and throw away the other eleven and try it again, in the hope that he may find a new queen worthy of his homage.

2181. Rosa rugosa (× ⅙).

Much of the charm of growing Roses is derived from the accurate knowledge of each variety by name. Yet few amateurs ever accomplish this, chiefly because the labels have been lost or misplaced, and not infrequently a plant becomes known to the cultivator by a name belonging to a neighboring specimen whose label has been misplaced, and replaced on the wrong plant. To obviate this a record should be made in a book kept for the purpose, with a chart for each bed. This should be done at once after the plants are set out and before the labels have become detached. Many vexatious mistakes might be prevented by some such plan as the following:



1 to 6. Her Majesty,
7 to 12. Margaret Dickson,
8 to 15. Gloire Lyonnaise,
16 to 20. White Baroness.

ROBERT HUEY.

Garden Roses near Chicago.—Climatic conditions surrounding the bluff lands bordering Lake Michigan, some twenty miles north of Chicago, are not congenial to the successful cultivation of outdoor Roses as a class, and only those possessing the most robust constitution among the Hybrid Perpetuals should be grown. Ample winter protection must be given along the lines indicated in the article in this work entitled *Winter Protection*. The soil is all that could be desired, being a rich yellow clay loam. The trouble seems to be in the severity of the winters, where heavy falls of snow are infrequent, and the springs late and fickle, warm winds from the southwestern prairies alternating with chilling moisture-laden breezes from the lake.

The beds are excavated to a depth of 2 ft., good drainage given, and then filled with a compost of rotted

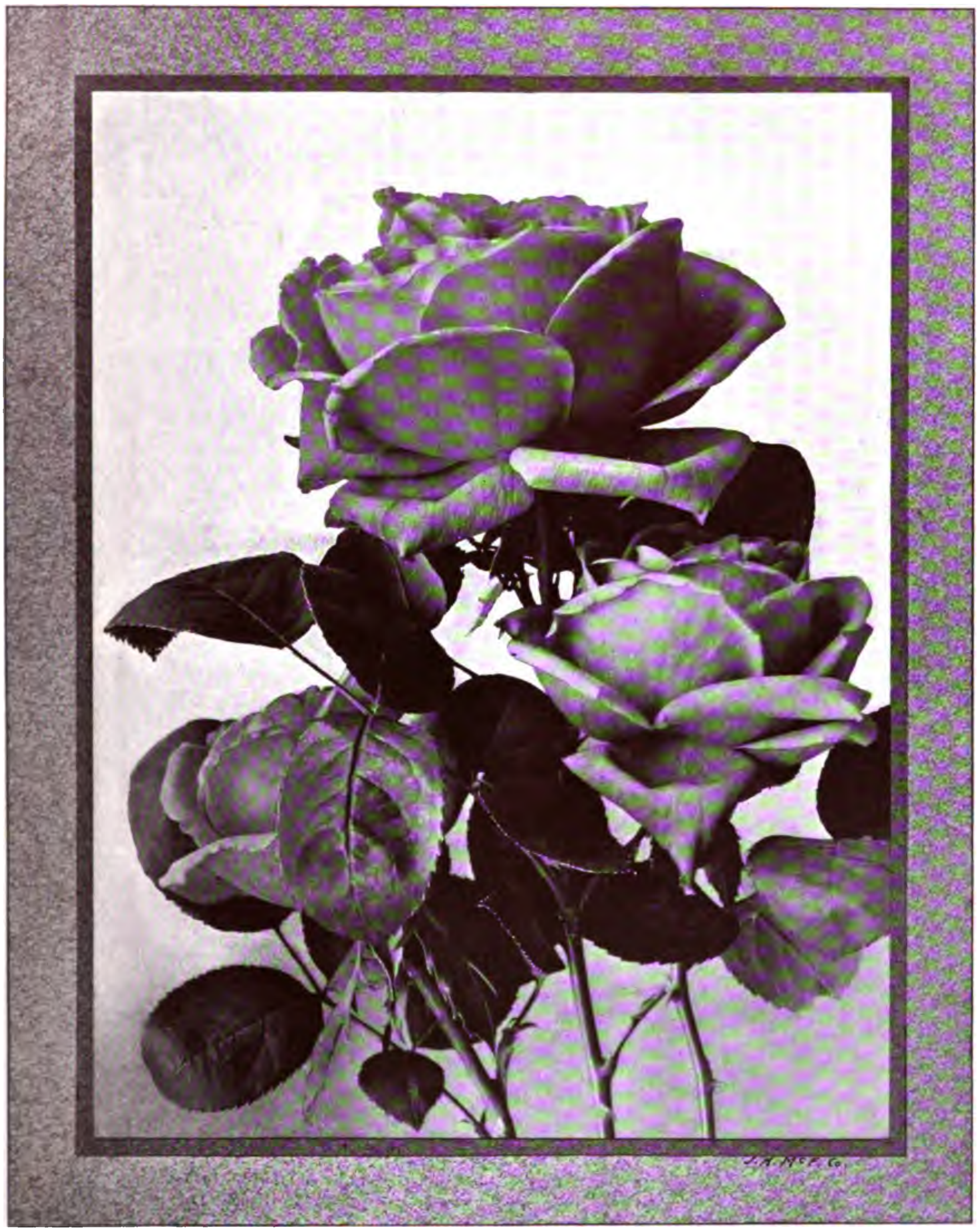


Plate XXXVI. Rose, American Beauty.

sod and cow manure. Each spring following, some manure and bone meal is forked into the surface. Liquid manure is given in June when the Roses are in full bloom, and a few times thereafter. The Roses are thoroughly sprayed with Bordeaux mixture when the leafage is fairly out, and once every three or four weeks afterwards. Hand-picking seems the best method of destroying the worms affecting the buds, and frequent drenchings with the hose abolish the other enemies. In the fall the canes are bent down and fastened to the base of their neighbors, and remain procumbent until the spring cutting-in, which is delayed as late as possible in order not to incite too early a start and to force the buds to "break" low down. After the leaves used in the winter protection have been removed, and the board roof also, the sides of the "box" are allowed to remain a short time in order to shield from the winds.

2182. Russian form of Rosa rugosa (X ½).

The winter of 1898–9 was unusually severe and did more damage to the Roses and other material than any other winter which the writer has experienced at Highland Park. Following is a list of the so-called Hybrid Remontants (H. R.) that wintered then—under protection—and came out in good condition. These varieties may therefore be considered the most suitable for this and kindred climates: Prince Camille de Rohan, H. R.; Magna Charta, H. Ch.; Mrs. R. G. Sharman Crawford, H. R.; General Jacqueminot (Rousselet), H. R.; Captain Christy, H. T. (Hybrid Tea); La Rosiere, H. R.; Captain Hayward, H. R.; Mrs. Paul, Bour.; Garden Favorite, H. R.; Louis Van Houtte, H. R.; Paul Neyron, H. R. (Fig. 2169); John Hopper, H. R.

The following dozen were in fair condition after the winter and recovered their form during the season: Mme. Victor Verdier, H. R.; Pierre Notting, H. R.; Anne de Diesbach, H. R.; Ulrich Brunner, H. R.; Baronne Prevost, H. R.; Eugene Furst, H. R.; Prince of Wales, H. R.; Alfred Colomb, H. R.; Lyonnaise, H. R.; Mme. Gabriel Luizet, H. R.; Countess of Oxford, H. R.

The list of those that winter-killed is too numerous to give, but it is a singular fact that the first list contains forms classed among the Teas and Bourbons. Of the climbing forms that were unprotected, *Rosa setigera* and its offspring, Prairie Queen, were somewhat injured; but Greville (Seven Sisters), Crimson Rambler, Thalia, Paul's Carmine Pillar, Multiflora and the Dawson Rose were in fairly good condition when wintered under protection. The failures even when protected were Aglaia, Alister Stella Gray, Euphrosyne, Russell's Cottage, Baltimore Belle, Tennessee Belle. The typical Sweetbriers proved hardy unprotected, but the hybrids of them were killed. Protected *R. Wichuraiana* and its hybrids killed back to the roots; *R. rugosa* and most of its hybrids, especially those of Jackson Dawson and Prof. J. L. Budd, unprotected, were all right; Mme. Georges Bruant (Fig. 2165), protected, was killed. Most of the Moss Roses stood well unprotected, especially Crested Moss.

Clothilde Soupert and Hermosa are the best bedders for permanent planting when protected, and the so-called Fairy Roses stand fairly well, especially Mlle. Cecile Brunner. Papa Gontier and Kaiserin Augusta Victoria are among the best of the more tender class that require the protection of a pit in winter. They seem to stand the biennial root disturbance well. La France browns in the bud under our sun, and, strange to relate, the writer cannot grow that splendid Rose Mrs. John Laing successfully, either on its own roots or budded. *R. rubrifolia* (or *ferruginea*), *R. spinosissima*, var. *Altaica*, *R. nitida*, *R. lucida* and *R. humilis* were hardy without protection.
W. C. EGAN.

Future Roses for the Prairie States.—West of Lake Michigan, and north of the 42d parallel, the fine Roses grown in the open air in the eastern and southern states can be grown only by systematic pruning and winter covering. Of well-known old varieties hardy enough to winter without protection, the list is short. Madame Plantier, White Harison, and *Rosa rugosa* with some of its hybrids, are hardy between the 40th and 44th parallel, and still farther north the East European *R. rugosa* and such of its hybrids as Snowlight, Empress of the North and *Rosa majalis fl. pl.*, are grown successfully. Figs. 2181 and 2182 show forms of *Rosa rugosa;* also Figs. 2162–64.

Of the newer hybrids of *R. rugosa* now quite widely tested, the most desirable are I. A. C. (Fig. 2183), Ames, Madame Georges Bruant (Fig. 2184), Madame Charles Frederick Worth, and Thusnelda. Kaiserin (Fig. 2185) is also to be commended. It is suggestive that these have come from crossed seeds of what is known in Europe as *Rosa rugosa*, var. *Regeliana* (p. 1556), and which we know as the Russian *Rosa rugosa*. The first two named came from seeds of *Rosa Regeliana* introduced by the writer in 1883 crossed with pollen of General Jacqueminot, and the last three were developed from seeds of *R. Regeliana* in Germany as stated by L. Späth, of Rixdorf near Berlin. They are all fine double Roses of the class shown in Fig. 2183, of the two produced at Ames, and all have retained to a large extent the foliage and habit of blooming of *R. rugosa*. The Russian *R. rugosa* as introduced from Russia by the writer is divided into two very distinct classes. The one from the Amur valley in North Central Asia is a very strong, upright grower with lighter colored bark, stronger thorns, thicker and more rugose leaves, and larger flowers than the Japan type, but its hips are smaller. The one from Russia in Europe is spreading and pendent in habit. When 4 ft. in height it has a spread of top of fully 6 ft. Its leaves

2183. The I. A. C. Rose (X ⅛).
One of the best hybrids of *Rosa rugosa* for the prairie states. (I. A. C.=Iowa Agricultural College.)

also have a darker shade of green than the Japanese type, and its buds are longer, more pointed, and show between the narrow folded petals shades of rich red and crimson. Its clusters of flowers also differ, as it has four to five flower-buds together, while the Japanese type has only two to three. In addition, we now know by trial that both these Russian types may be grown successfully two degrees farther north than the Japanese *R. rugosa*.

The work of crossing the Russian *R. rugosa* began at the Iowa Agricultural College in June, 1892. The pollen of over a dozen of the best garden varieties was used, but that of General Jacqueminot was used most extensively, as it produces pollen most freely. The final result was quite unexpected, as no double variety with rugose leaves was produced when the pollen of any variety was used except that of General Jacqueminot. From 497 flowers of *R. rugosa* fertilized with pollen from General Jacqueminot, we grew 255 plants. From these we were able to select over 20 varieties with double flowers ranging in number of petals from 15 to 150, with handsome rugosa foliage and surprising vigor of growth. Nearly all showed the crimson color of petals of the male parent.

At the same time we pollinated the blossoms of our native species *Rosa blanda* and *Rosa Arkansana* with pollen of General Jacqueminot and other Hybrid Perpetuals, but wholly without valuable results, as the crosses seemed too violent. Most of the hybrids showed modified foliage and habit of growth, but all except three bore single flowers. The three double varieties developed blossom-buds freely, but in no cases have the blossoms expanded into perfect flowers. When apparently ready to expand they began to turn black in the center and drop off. It is also well to state that the pollen of White and Yellow Harison used on *Rosa rugosa*, var. *Regeliana*, developed remarkably vigorous hybrids which gave clusters of promising buds, but up to the present not a single flower-bud has fully expanded. The late E. S. Carman, however, reported better results with this cross of Harison's Yellow and rugosa (A. G. 1890, p. 665), and a picture of one of his hybrids is shown in Fig. 2186. As in Europe, our marked success has been with the pollen of General Jacqueminot, which seems to show a near affinity to all the types of *R. rugosa*.

With increased experience other cultivated varieties will be discovered that will cross in a profitable way with *R. rugosa*, and still others will be found that will cross profitably with our native species. At present, however, the east European *R. rugosa* seems to be the most promising progenitor of the future Roses of the Northwest. We already have fine double varieties with 60 petals, such as the I. A. C., with the rich color of General Jacqueminot and the fine leaves of *R. rugosa*. The main trouble at present is in propagation. As with the type, the best hybrids of *R. rugosa* are difficult to grow from cuttings. We find that they can be budded readily on strong seedlings of our native species.

It may be in the near future that the seeds of the large-growing Wild Roses of the Black Hills will be used by propagators for stock-growing. When that time comes we already have varieties hardy enough for the North that compare favorably with the best varieties of more equable climates. Strong-growing stocks are advised, as the vigor of some of the hybrids is remarkable. On the writer's lawn is a bush of the Ames variety three-years old that stands 7 ft. high, with several stems three-fourths of an inch in diameter.

J. L. Budd.

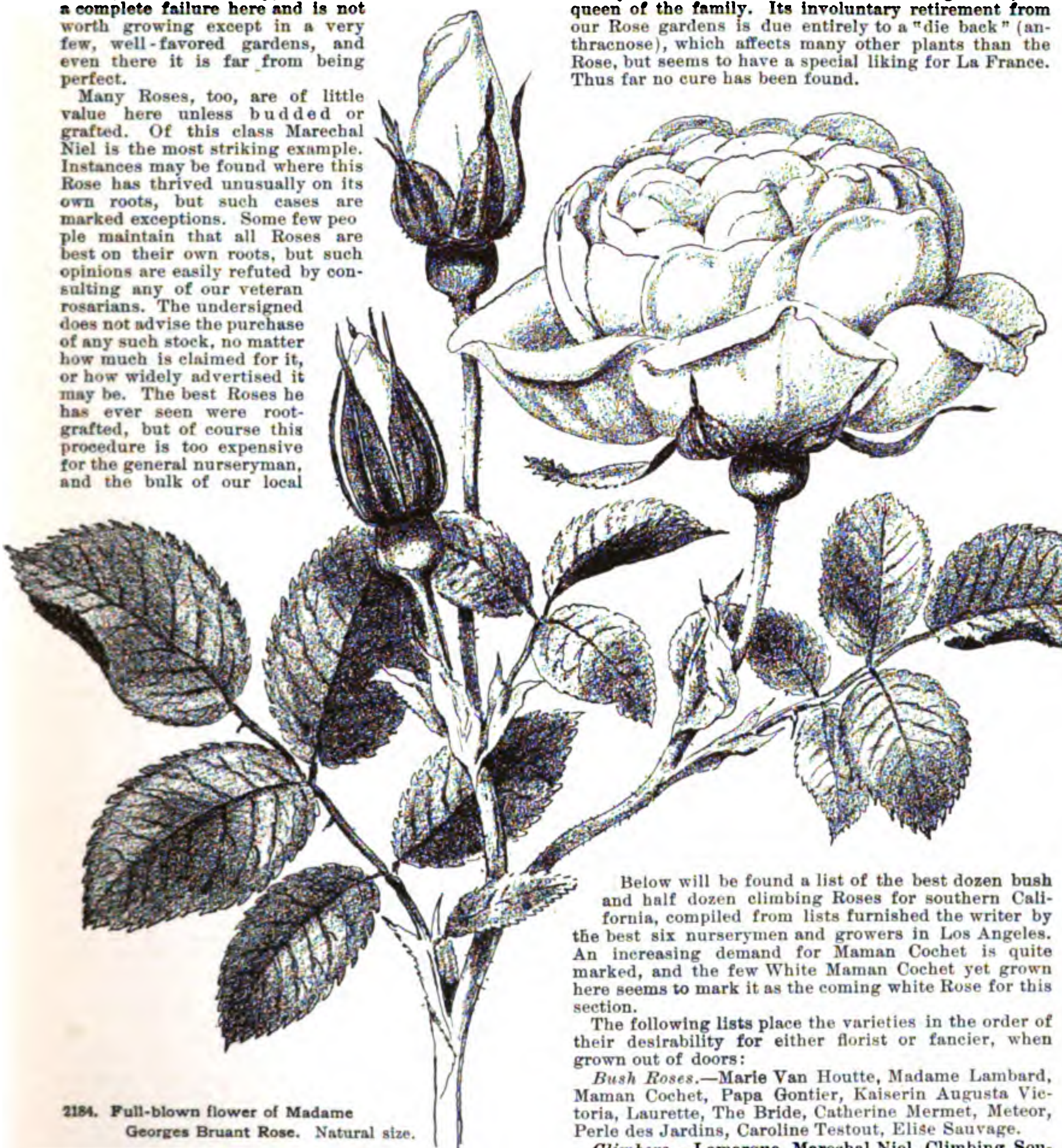
Roses in Southern California.—In many localities in southern California the Queen of Flowers attains a perfection probably found nowhere else. That this perfection is not general throughout southern California is partially owing to adverse conditions, such as great range of temperature during each twenty-four hours, heavy fogs at critical periods, etc., but as a rule, failure in whole or in part is due to the lack of intelligent treatment. The chief obstacle to successful culture is the attempt to produce blooms every day of the year. Although this practice is quite an impossibility with any Rose, the evil is still persisted in by ninety-nine in every hundred possessors of a garden. While Roses are grown in great profusion in Los Angeles, few, if any, do as well here as in Pasadena, which, although only nine miles distant, has the advantage of being several hundred feet higher than Los Angeles, and therefore less subject to fog or great range in daily temperature. In some places a certain few Roses will produce an astonishingly fine crop of bloom, when but a mile or two distant, with no change of soil and very slight difference in altitude, they will be utterly worthless; while a like number of other varieties will give as good returns as those first mentioned. Consequently the common inquiry at a nursery as to "What are the best dozen Roses I can grow?" is usually met by the equally pertinent query: "In what part of the city do you live?"

Many Roses do fairly well everywhere, and among these Duchesse de Brabant more nearly produces a continuous crop of blossoms than any other. For this reason it stands in a class by itself and is not considered in the appended list of the best dozen Roses for southern California, though every one should grow at least one bush of this variety. Along with the Duchesse might well be placed the Polyantha Madame Cecil Brunner, and the climbers Cherokee, Banksia, Ophire (or Gold of Ophir), Beauty of Glazenwood or Fortune's Double Yellow. All these produce most wonderful crops, but none more so than the last mentioned, which in favored regions produces a wealth of flowers simply dazzling to behold. Many well-known Californian writers assert that Gold of Ophir and Beauty of Glazenwood are one and the same Rose, but this is by no means the case and the writer can furnish satisfactory ocular proof to any who choose to doubt this statement. Gold of Ophir was here for many years before the other made its appearance, and some of the original plants are still growing on many of the old homesteads of Los Angeles and vicinity.

All the Roses named thus far are worthy of a place in any garden. One of the chief causes of failure by the average amateur is the lack of an intelligent knowledge of the plant's first requirement—recurring periods of absolute rest. These necessary resting periods are best secured by the withholding of the water supply. Most amateurs, and a majority of self-styled "gardeners," persist, against all rules of common sense, in planting Roses either in the lawn or in mixed borders with other plants. In either case, all but the Roses require a constant watering. Having planted in this fashion, the grower has cast away all chances of first-class results. Rose beds should never be made a feature in landscape gardening, as the plants when dormant and judiciously pruned are unsightly objects at best. The most obscure spot obtainable with the proper exposure is the place to grow flowers. To obtain the best results the Rose requires the same amount of rest here that it secures where the winter season leaves the grower no alternative. But the same amount of rest may here be given semi-annually, with equally as good and perhaps better results than is possible with one long annual period of inactivity.

The writer firmly believes that with a proper exercise of intelligence in the selection of varieties and subsequent care of plants, better results can be obtained in California than in any other state in the Union. Though some few localities must be excepted, they form but a very small area and may be passed with a mere mention of their existence. Climate is the all-important feature of Rose culture in this section, and if that be satisfactory the character of the soil makes little difference. Our dry summer air is a serious drawback to the growth of many Roses, there being few places where Moss Roses thrive, and these must be grown in whole or partial shade. Niphetos and Marechal Neil are good examples of Roses requiring partial shade if good results are desired. Many localities cannot grow the two last mentioned, or such as Perle des Jardins, Meteor, Catherine Mermet, Francisca Kruger, Reine Marie Henriette, and many others, on account of mildew. Even among varieties whose buds are immune, it is often impossible to get foliage unaffected. Injudicious watering is more largely to blame for these unfavorable conditions than any other agency. Laurette is a Rose which often produces the only perfect flowers to be found among a hundred varieties, and this is particularly the case in places visited by heavy frosts, Laurette remaining unscathed, while all others are more or less blasted. The great Rose of the eastern United States, American Beauty, is almost a complete failure here and is not worth growing except in a very few, well-favored gardens, and even there it is far from being perfect.

Many Roses, too, are of little value here unless budded or grafted. Of this class Marechal Niel is the most striking example. Instances may be found where this Rose has thrived unusually on its own roots, but such cases are marked exceptions. Some few people maintain that all Roses are best on their own roots, but such opinions are easily refuted by consulting any of our veteran rosarians. The undersigned does not advise the purchase of any such stock, no matter how much is claimed for it, or how widely advertised it may be. The best Roses he has ever seen were root-grafted, but of course this procedure is too expensive for the general nurseryman, and the bulk of our local stock is budded on Manetti or Maiden's Blush, though the Dog Rose (*Rosa canina*) and even the Banksia are often used. Those Roses grown on their own roots are usually propagated from hardwood cuttings, grown out of doors, and December is usually the best month, though the writer has successfully rooted them from October to March, according to the variety.



2184. Full-blown flower of Madame Georges Bruant Rose. Natural size.

Rust bothers us but little; likewise scale, though in many neglected gardens the bush and climbers alike may be found covered with both the rose scale and the red scale of the orange. Fuller's rose beetle is a nuisance only in small areas, but green aphis is quite a pest in winter and spring. La France for many years was the leading Rose in California and grew well, budded or on its own roots, in almost any locality, but is now rapidly becoming a thing of the past, though it can never be wholly discarded, for it is still, in a few gardens, the queen of the family. Its involuntary retirement from our Rose gardens is due entirely to a "die back" (anthracnose), which affects many other plants than the Rose, but seems to have a special liking for La France. Thus far no cure has been found.

Below will be found a list of the best dozen bush and half dozen climbing Roses for southern California, compiled from lists furnished the writer by the best six nurserymen and growers in Los Angeles. An increasing demand for Maman Cochet is quite marked, and the few White Maman Cochet yet grown here seems to mark it as the coming white Rose for this section.

The following lists place the varieties in the order of their desirability for either florist or fancier, when grown out of doors:

Bush Roses.—Marie Van Houtte, Madame Lambard, Maman Cochet, Papa Gontier, Kaiserin Augusta Victoria, Laurette, The Bride, Catherine Mermet, Meteor, Perle des Jardins, Caroline Testout, Elise Sauvage.

Climbers.—Lamarque, Marechal Niel, Climbing Souvenir de Wootton, Reve d' Or, Reine Marie Henriette, Gloire de Dijon. This list will be found to be the best for Los Angeles and vicinity in general. The intelligent nurseryman or careful purchaser should be able to make the slight changes required by peculiar conditions.

To Mr. Frank Huston, nurseryman of Los Angeles, the writer is indebted for many valuable points contained in this article; also to Mr. Wm. S. Lyon, whose little booklet, "Gardening in California," contains the best practical treatise on Rose-growing ever published on this coast.

ERNEST BRAUNTON.

2185. Rosa rugosa, var. Kaiserin (X ⅛).

Some Recent Rose Hybrids (*Rosa multiflora, R. rugosa and R. Wichuraiana crossed with various types*).—It is now about sixteen years since the undersigned became interested in hybridizing Roses, especially *R. multiflora* (the Japanese type), *R. rugosa* and *R. Wichuraiana*. The earliest experiments were made with *R. multiflora*, the object being first to obtain colored flowers and afterwards to get double ones, but always to keep the hardiness and habits of growth of *R. multiflora*. There are few pillar or half-pillar Roses that will stand our New England climate without protection, and therefore this type was chosen as the hardiest, and effort was made to retain its strong constitution and later to get other improvements. How far the writer has been successful may be judged by his exhibits at the Massachusetts Horticultural shows and by a visit to the Arboretum. This work, started by some others as well as the undersigned, has been the means of having these new types of Roses taken up by the growers, and there are many possibilities for improvement. There seems to be no reason why they should not be as fine for use in the garden as the Hybrid Perpetuals are for flowers.

The first cross made by the writer was with General Jacqueminot, *R. multiflora* being the female parent, and the result was anything but satisfactory. At last a break was made. All sorts of forms were secured, some resembling both parents in flower and foliage, but most of them were worthless. Two were saved, one with large clusters of double purplish Roses, fully as large as Jacqueminot, with a big stem closely set with heavy spines, a long, rampant growth unlike either parent, the foliage of a Hybrid Perpetual and flowers in clusters of 10 to 20. The other, the widely known Dawson Rose (silver medal Mass. Hort. Soc. 1894) has large clusters of bright rose flowers, 20 to 40 on a stem, bright shiny foliage and a strong growth, sometimes running up 15 feet or more in height. The writer again crossed *R. multiflora* with Madame G. Luizet and obtained a half-climbing plant with large, single white flowers in clusters. An attempt was then made to cross these three crosses with other choice Roses for still further improvement, but no perfect seeds were made except on the Dawson. By crossing the Dawson with other Roses several fine forms have been secured, beautiful types of cluster Roses, single, semi-double and double, all more or less with the habit of *R. multiflora* in the truss and with white, peach, salmon, red and purple flowers. Attempts have been made in crossing the Yellow Harison Rose with the Dawson and *R. multiflora*, but so far with no encouraging results. The writer now has about 500 hybrids, three years old, made with differing varieties of Hybrid Teas and Yellow Harison on the Dawson, with results still to be determined. All these were crossed out of doors with every precaution possible, but the results are not so likely to be as good as when the work is done under the more perfect control of the greenhouse. A cross between the Dawson and Crimson Rambler has so far resulted in a single deep pink flower borne in clusters.

In crossing *R. rugosa* with Jacqueminot every conceivable form was obtained, some with narrow pointed petals, some semi-double and others single, dark and light colors. One had a deep rich crimson flower, darker if anything than Jacqueminot, very fragrant, with strong, heavy foliage, showing the influence of both parents. This seemed like a promising foundation for a fine race of hardy Roses, but for five years all efforts to get a single hip to mature when fertilized with others have been in vain. This is the Arnold Rose and received the silver medal of the Massachusetts Horticultural Society in 1893. In this batch of seedlings was one that was very double and in color like Magna Charta, but unfortunately some one else wanted it and one day it disappeared from the nursery. The writer has also crossed *R. rugosa* with Yellow Harison, but as yet has obtained no yellow Roses of the Rugosa type. On the contrary, they are the biggest lot of mongrels one ever saw, in both foliage and flower. The Rugosa foliage is completely obliterated, and the Harison retained, while the flowers are small and generally a dirty salmon color. The writer was so disgusted with the lot that he threw them all away after working more than four years on them.

Attention was next given to *R. Wichuraiana*. The possibilities of crossing this seem to be unlimited. No Rose that the undersigned has ever tried yields so readily to hybridizing. The first attempt was with Jacqueminot, always using *R. Wichuraiana* as the mother plant. The results were excellent. While some plants were nearly *R. Wichuraiana* they were entirely different in shape and color; they had the clusters,

2186. A Rugosa hybrid—Harison's Yellow X R. rugosa (X ⅛).

but the habit was half-scandent instead of prostrate. The first to bloom was single, delicate rose with a nearly white center, a rampant grower, attaining 6–8 feet in a season; foliage fine, somewhat resembling the Bourbons, but also retaining the gloss of *R. Wichuraiana*. So far it has produced no seeds. Another was of medium growth, with bright shiny leaves and clusters of double purplish pink flowers, fading to lilac. The best of the lot has been named W. C. Egan, and received the silver medal of the Massachusetts Horticultural Society in 1896. This is, without doubt, one of the finest hybrids of *R. Wichuraiana* at present. The flowers are in large clusters and very double, of a delicate flesh color, resembling Souvenir de la Malmaison almost exactly, but somewhat smaller; the foliage is also like Malmaison but brighter. It is perfectly hardy in the nursery and elsewhere without protection.

Next *R. Wichuraiana* was fertilized with pollen from *R. setigera*, and while decided crosses were obtained the results were not altogether satisfactory. One of the best was saved for future use. The flowers are in color near *R. setigera*, and the growth prostrate as in *R. Wichuraiana*, but shorter jointed. The plant is very hardy. *R. Wichuraiana* was next crossed with *R. rugosa*, with more than pleasant results; Lady Duncan, silver medal from the Massachusetts Horticultural Society in 1900, having the prostrate, long, rampant growth of the mother, while the Rugosa blood shows in the foliage spines and flowers, these last being a warm, lively pink and making a delightful contrast to the yellow stamens. Another is somewhat deeper in color but of less vigorous growth. A curious fact concerning these extreme crosses is that not one of the Wichuraiana hybrids described above will set seed, no matter how treated. From *R. Wichuraiana* impregnated by Crimson Rambler has been obtained thus far only single, pale pink bloom and foliage intermediate between the two, but with the creeping habit of the mother. *R. Wichuraiana* fertilized by Belle Siebrecht loses its character except to a slight degree in the foliage; the habit is erect, strong and with stout spines; the flowers are single, rosy pink. This plant, if it will set seeds, may produce an entirely new strain. *R. Wichuraiana* crossed with Clothilde Soupert makes plants less vigorous than itself; the foliage recalls both parents and the double flowers are in color like Soupert. *R. Wichuraiana* crossed with *R. Indica*, var. *carnea* has produced one with rich crimson flowers, single, with foliage neither as glossy nor as strong as its mother, but with the same creeping habit: unnamed silver medal, Massachusetts Horticultural Society, 1899; this bids fair to be the forerunner of a fine race. *R. Wichuraiana* crossed with Triomphe de Luxembourg (hyb. China) has given several distinct forms, one with double rosy purple flowers in clusters and creeping habit; another is double, light pink with shining leaves. *R. Wichuraiana* crossed by Bardon Job has given a single-cluster Rose similar to Carmine Pillar, and the writer has many other crosses between *R. Wichuraiana* and different Tea Roses and *R. repens (arvensis)* with double and single flowers ranging in color from white to rosy pink and salmon; there are few of these seedlings which do not have some merit, and all can probably be improved. The crosses between *R. Wichuraiana*, Jacqueminot, *R. rugosa* and Belle Siebrecht will not bear seeds, but those with varieties of *R. Indica* bear seeds freely. Attempts will now be made to cross those of satisfactory color with the Hybrid Perpetuals and Hybrid Teas.

Several seedlings of crosses between Crimson Rambler and Wichuraiana have recently flowered. The result was extraordinary, no two being alike and each individual was a different shade of color, ranging from a pale rose to a deep rosy purple and from single to double. The best of this cross is a very double Rose, larger than Crimson Rambler. Compared with the carnations Melba and Marquis, the fresh flowers are nearer to Melba, while the flowers of a week old are nearer to Marquis. They are so near the color of these two carnations that put in the midst of the two flowers it is almost impossible to tell the difference between the two carnations and the Rose. The habit is of Wichuraiana, and the foliage is more brilliant. The plant grows 5 to 6 feet in a season, lying close to the ground. There is no doubt that this is one of the best hybrids of Wichuraiana yet known regarding color, foliage and flower.

In summing up the experiments of these hybrids, it is well to say that possibly more highly colored Roses might have been produced, but it would have been at the expense of their hardiness.

In making these crosses the writer has always carefully removed the stamens before there were any signs of anthers opening, cutting through the petals while in bud. A gauze covering was placed over the flowers both before and after impregnation, to guard against insects. To keep the record, names and date on a small wooden tally were attached to the cluster. Sometimes the yield in seeds is poor enough, only one in a hip and many times none. The writer is always doubtful of the cross when the fruit is too full of seeds. As *R. Wichuraiana* opens after the other Roses have passed, it is a good plan to pot up a few and bring them into the greenhouse in March; they will then bloom at the same time the Hybrids, and others, are in flower out of doors. All Roses can be prepared and pollinated in the greenhouse more easily and with better results than in the open air. When the plants are protected from bad weather there is less danger that rain or dew will interfere with one's labors. A sharp knife, a pair of forceps, some fine gauze and a good hand-lens are sufficient tools for the work. Always examine the stigma to see if it is ripe, and, after applying the pollen, look again to see that there is plenty and in the right place. If the flowers which are to furnish the pollen are gathered early in the morning and then placed on a pane of glass in a warm greenhouse, the anthers can be opened much easier than if left longer on the plant. Moreover, there is less risk of the pollen having been contaminated by insects.

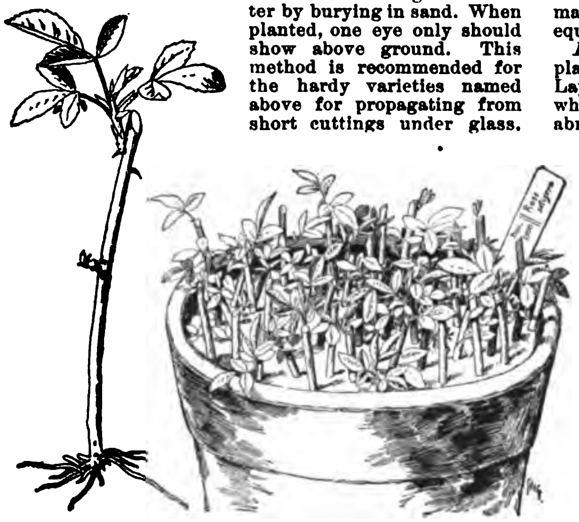
JACKSON DAWSON.

Propagation of Roses.—The Rose is propagated by seeds, cuttings, grafting or budding, by layers and by division. The genus is so large and diversified and our requirements are so many that the whole art of the propagator is needed to satisfy the claims of the Queen of Flowers.

Seeds.—Roses are grown from seeds not only to obtain new varieties but also because many true species are economically procured in this way, e. g., *R. canina*, *R. multiflora*, *R. ferruginea*, *R. rugosa*, *R. rubiginosa*, etc. The seeds should be gathered in autumn and at once stratified with moist sand or allowed to ferment in tubs, with a little water and kept in a fairly warm place. When well rotted they can be easily rubbed and washed clean and should be planted at once, either in carefully prepared and well-manured beds out of doors or in pans or flats in a cool greenhouse. It is sometimes advised that the hips should first be dried and then rubbed clean, but this method often causes delay in germination, a matter sufficiently troublesome without additional complications. Whether they are planted under glass or in the garden it is difficult to forecast their coming up. It may be within a few weeks, e. g., *R. multiflora* under glass; or at the beginning of the second growing season after planting, e. g., Sweetbrier seed, planted out of doors in November, 1898, may be expected to germinate in the spring of 1900, while *R. rugosa* sown at the same time may come up the following spring, i. e., in 1899, or, a season intervening, it will appear with the Sweetbrier in 1900. Stratifying or fermenting the seeds tends to secure uniform germination within a reasonable time. It has also been suggested, and many things confirm the idea, that early gathering helps to hasten germination; in other words, do not wait for excessive ripeness, but pick the hips as soon as the seeds harden, some time before the fruit is deep red. Until these matters are better understood, all Rose seed sown out of doors, either in autumn or spring, should be mulched 2 in. deep with pine needles or other litter. Frequent examinations should be made in spring and the covering at once removed when the seedlings appear; if they do not appear let the mulch remain to keep down weeds and retain moisture in the seed-bed. Pans or flats in which seed has been planted should be kept at least 18 months before discarding, with the soil always moist. Notwithstanding the difficulties of germination, the young seedlings make most satisfactory growth and can generally be transplanted into nursery rows when one year old. When two years old they are fit for permanent planting. A winter protection of pine boughs is helpful to the young plants. Some seedling Roses are extremely precocious, blooming before they are one year old, e. g., some Hybrid Perpetuals and Polyantha Roses. The first flowers of seedling Roses do not always indicate their real character; in hybridizing it is well to wait for the second or third season before discarding.

Cuttings.—These are a common means of propagation, both under glass and out of doors. Under glass short cuttings 2–3 in. long can be made in November and December from wood of the current year's growth. They should be planted in sand, in flats or pans, and kept in a cool greenhouse. They root in February or March, and can either be potted in thumb-pots or kept on in flats until May or June, when they should be planted out in rich beds; salable plants are obtained in October. This is a good way to strike *R. setigera* and its varieties, Crimson Rambler and its allies, *R. multiflora*, *R. polyantha*, and their offspring, *R. Wichuraiana*, Madame Plantier and doubtless many others. *Rosa Indica*, in all its forms, all tender species and many Hybrid Perpetual Roses are propagated by cuttings of hardened wood grown under glass; Peter Henderson says the wood is in the best condition when the bud is "just open enough to show color." Blind eyes can also be used, and the smaller wood is better than the strong rampant growths. Plant in sand in a warm house; bottom heat and a close frame are often used but are not necessary. The cuttings are from 1½–2 in. long; single eyes strike readily.

In the open air cuttings of ripened wood can be planted in spring in V-shaped trenches in carefully prepared and well-manured ground. They make strong plants in autumn. Wood of the season's growth is gathered before severe frost, cut into 6-in. lengths, tied in bundles, and stored through the winter by burying in sand. When planted, one eye only should show above ground. This method is recommended for the hardy varieties named above for propagating from short cuttings under glass, but will not give such a large percentage of rooted plants. It is highly probable that some Moss Roses, *R. lucida*, *R. Carolina*, *R. spinosissima*, etc., Roses which sucker, could be propagated by cuttings of root or rootstock, but no systematic attempt has been made in this direction.



2187. Short hardwood cuttings of Rosa setigera. A single cutting is shown at the left.

Budding and Grafting.—These are old and well-established methods of propagation. Budding in foreign nurseries is practiced in the open air in June and July, with us in July or August. A dormant shield bud is employed. The stock is *R. Manetti*, *R. canina*, or any good brier, or *R. multiflora*; in Holland *R. Carolina* is esteemed. In European nurseries *R. canina* is used for standard, *R. Manetti* for dwarf stocks. Under glass Roses are budded also, with a shield-bud, at any season when the bark slips, using for stock a vigorous variety. About Boston the yellow and white Banksian Roses once had high local repute for stock for Tea and other tender kinds.

Grafting Roses in the open air in this country is not often employed, but in the South Hybrid Perpetual and other hardy Roses are said to be root-grafted in winter (very much as apples are root-grafted), tied in bundles, stored in sand and planted out in early spring, the worked portion being set well below the surface. Root-grafting is an easy and convenient method of propagation under glass. Jackson Dawson's practice is to use the whip- or splice-graft, but the veneer-graft is also employed, with bits of *R. multiflora* root 2–3 in. long for the stock, the cion being somewhat longer but of equal diameter. They are firmly tied with raffia and waxed; made into bunches they are covered with moist moss in an open frame in a coolhouse and left until united. They are then potted off and grown on until they can be hardened off and planted out in May or June, the point of union being well below the surface. A specimen of Mr. Dawson's work is shown in Fig. 2188, the stock being a bit of *R. multiflora* root; its age is about three months. *Rosa multiflora* is an excellent stock for garden Roses, since it does not sucker; this great advantage, too, is also obtained by using the root-graft as above described. Some of the commercial florists use Manetti stock planted in thumb-pots. Cut back to the root, this is splice-grafted and kept in a warm, close frame until united; they are afterwards grown on in pots until large enough to plant out in the beds, in which they will flower the following winter. There is some difference of opinion among gardeners as to the respective merits of own-root and grafted plants; just now many of the foremost growers prefer the latter for forcing. It is a perplexing question and could only be settled by a series of exact experiments costing much time and money. It is also quite possible that matters of temperature, soil, moisture and food are equally important factors.

Layering.—This method is employed only when few plants are required; it is cumbersome and wasteful. Layer in spring, using wood of the last year's growth where possible; the bark of the buried portion should be abraded.

Division.—This is an easy means of increasing *R. lucida*, *R. nitida*, *R. Carolina*, *R. spinosissima*, Crimson Moss and many other varieties which sucker. Plant thickly in good soil, allow them to grow from three to four years, then lift and tear apart. It will be found that the increase is large and that plants so obtained are salable after one year's growth in the nursery. The year in the nursery may be omitted with the quicker-growing kinds which are to form new plantations on the same estate

B. M. Watson.

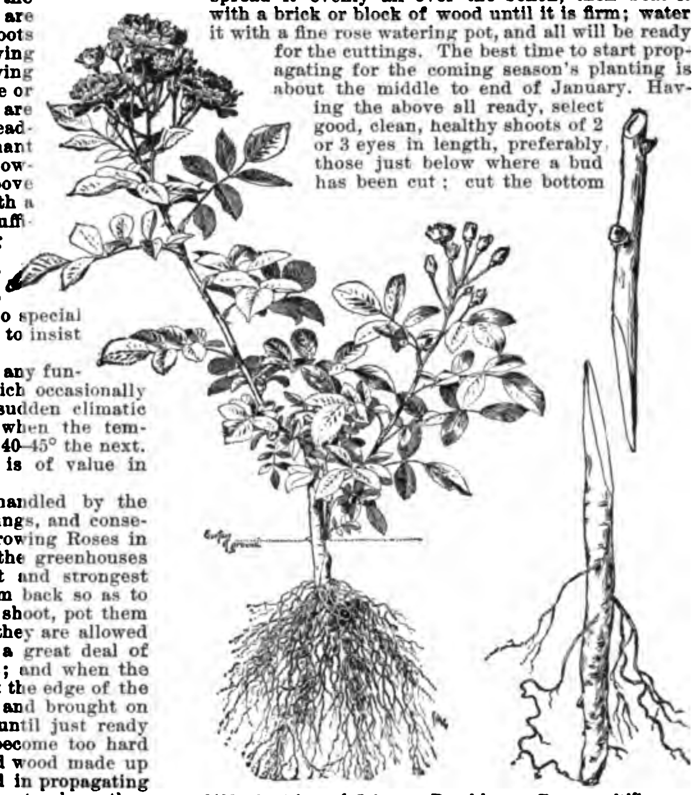
Budded Roses vs. Roses on their own Roots.—For the average amateur Rose planter, we cannot too strongly recommend the desirability of own-root plants. Scarcely one planter in a thousand is observing enough to notice the difference between "suckers" or sprouts from the stock of a budded Rose and the variety that is budded in. Indeed, upon some varieties the growth is so similar as not to be readily noticed even by those familiar with Rose-growing. In consequence many purchasers of budded Roses allow these suckers or sprouts from the roots to grow up and, being usually of much more vigorous habit than the variety budded in, they in a short time quite run out the bud, and the purchaser is left with nothing upon his hands but a natural Rose of whatever variety the stock may have been. For florists' use in forcing and also for the use of planters, who are thoroughly familiar with such things, budded Roses answer equally well and in some varieties are perhaps superior; in that they will produce a larger quantity of flowers and force more easily. The stock most used in western New York for budding Roses is *Rosa Manetti*, and that seems to be about the best adapted for the purpose. *Rosa multiflora de la Griffœrie* is also used more or less, but is generally considered not so desirable, since it is not as hardy as the Manetti and is still more likely to throw up suckers from the roots, in which respect the Manetti is bad enough. *Rosa canina* (Dog Rose) and *Rosa polyantha* are largely used in Europe as stocks upon which to graft Roses. They have never been largely used in this country, the Manetti seeming to be the favorite here. All of these stocks are grown more extensively in France than anywhere else. The *Rosa Manetti* and *Rosa multiflora de la Griffœrie* are grown from cuttings in France, and are shipped from there at the end of the first season; when received here they are trimmed back closely, both as to the roots and the branches, and planted the following spring. They are budded the following summer, usually the latter part of June or early part of July, whenever the stocks are in such condition that the bark peels readily. The bud, of course, remains dormant during that season, but the spring following the top of the stock is cut off just above the bud, and it is allowed to grow. With a good season, the buds usually make sufficient growth to be salable the following fall. The foregoing is written solely in connection with the outdoor growing of Roses. Except to provide good rich deep soil of fairly heavy quality, there are no special cultural directions that the writer cares to insist upon.

Rose plants are not often attacked by any fungous disease, save perhaps mildew, which occasionally makes its appearance consequent to sudden climatic changes, such as occur toward fall, when the temperature may be at 80–90° one day and 40–45° the next. An application of Bordeaux mixture is of value in checking mildew.

The greater proportion of Roses handled by the undersigned are propagated from cuttings, and consequently are on their own roots. In growing Roses in this way, it is customary to take into the greenhouses about the first of December the best and strongest plants that are in stock; then cut them back so as to leave only two or three eyes upon each shoot, pot them and place them in a cool house, where they are allowed to stand two or three weeks without a great deal of heat. They soon begin to make roots; and when the white roots show through the soil about the edge of the pot, they are given a little more heat and brought on more rapidly. They are then forced until just ready to flower, and before the wood has become too hard the plants are cut back and the severed wood made up into one-eye cuttings, which are placed in propagating beds of sand and given gentle bottom heat, where they take root in the course of two to four weeks, according to variety and the condition of the wood. After thoroughly rooted, they are potted into 2- or 2½-inch pots and grown on until late in the spring or early summer, when it is safe to plant them out in the fields. There they will remain two seasons, usually, and by that time attain sufficient size to be dug and marketed.

Jackson & Perkins Co.

Rose Forcing.—There is no branch of floriculture in this country that in any way approaches Rose forcing in importance, when commercial and private practice are considered. The large number of private greenhouses erected for the cultivation of the Rose by wealthy people in this country within the last decade cannot be adequately estimated. But the great demand for choice Roses among all classes of buyers throughout the country has produced an enormous increase in commercial greenhouses specially erected for growing and forcing Roses, and each year sees some improvement in the style of construction as well as in methods of cultivation. The general principles of Rose-growing are practically the same now as they were twenty years ago, but the details or small items, as many are pleased to term them, are constantly being improved. To make the method of successful cultivation quite plain to every one, the undersigned will endeavor to detail closely each operation, from the cutting to the full bearing plant. Types of forcing Roses are shown in Figs. 2189 and 2190.



2188. Grafting of Crimson Rambler on Rosa multiflora.

Showing plant three months old. At the right is shown the detail of the splice-graft.

We shall presume that a propagating house is to be prepared for starting the young stock. This is a greenhouse in which a bottom heat of not less than 60° can be maintained as long as the cuttings are in the sand during the winter; the mean temperature of such a house should be about 55 or 56°. The style or position of the house is of no great consequence if the above temperature can be maintained. Start, then, by making a bench having space for sand 2½–3 inches deep. Take a clean, sharp, gritty sand, without any coarse stones in it, spread it evenly all over the bench, then beat it with a brick or block of wood until it is firm; water it with a fine rose watering pot, and all will be ready for the cuttings. The best time to start propagating for the coming season's planting is about the middle to end of January. Having the above all ready, select good, clean, healthy shoots of 2 or 3 eyes in length, preferably those just below where a bud has been cut; cut the bottom leaf clean off close to the eye; make a clean cut diagonally across the shoot just below the bottom eye. If the leaves are large and heavy, remove the end or fifth leaflet. Then, with a lath about 2 inches wide laid straight across the bench and held firm by the left hand, and with a thin knife in the right hand, draw a line about 1½ inches deep in the sand; in this place the cutting, pressing each down to the bottom of the opening, leaving just enough room between each cutting so that the leaves do not overlap each other. As soon as the row is full, press the sand as firmly as possible around each cutting; then give a good watering with a fine rose watering pot. Repeat the same operation on each successive row till the whole are put in. Shade from bright sun and never allow the cutting to suffer for want of water. If the weather should be at all warm, a light syringing overhead daily will greatly benefit the cuttings; never use very cold water on them, but water of about the same temperature as that of the air. Treated as above, the cuttings should be nicely rooted in about 30 days; and as soon as they have made roots about ½ in. long they should be carefully lifted from the sand with a flat stick to avoid breaking their roots, and potted in 2- or 2¼-inch pots, using a good fresh soil with only a little manure added,—not more than 1 part manure to 8 of soil. As fast as potted they should be placed in a greenhouse having a temperature of about 56° at night and shaded with sheets of newspaper or similar material from bright sun for a few days till they show some indication of starting into growth. The actual time that shading will be required will depend largely upon the weather and the season of the year. Do not over-water the young plants at any stage, but give just enough to moisten the whole soil nicely when first potted and then as required afterward. Do not put them in the shade of other plants, but place them where they will get the full benefit of all the sunlight and plenty of air as soon as shading can be dispensed with; such treatment will produce a clean, healthy, stocky plant, which means a good constitution. Should greenfly appear on them, fumigate with tobacco stems immediately. Syringe overhead on all bright days. In about five to six weeks from the time of first potting, the plants will be ready for a shift into a larger size pot,—3-inch size will be large enough. The same class of soil can be used as for the first potting, or if the plants are to be put into their season quarters, i. e., planted into benches from this size, a little more manure can be added; but if they are to be grown on in pots, some growers will prefer to give them a third shift, namely into 4-inch pots. The plants, if properly cared for, should be ready for this last shift in about six to eight weeks from the time they are planted into 4-inch pots. In this last shift soil considerably richer can be used. Keep off all the buds so as to have the plants sturdy, strong and vigorous.

2189. American Beauty, now the most popular florist's Rose in America (× ⅓).

The picture shows a specimen grown in the open.

Presuming that this method has been followed through till the end of May or beginning of June, the plants will be ready for benching out, or, in other words, to be put into their winter quarters. The benches should hold 4–5 inches of soil and the bottom slats of said benches should be placed not less than ½–¾ in. apart to allow for ample drainage. If plants have been grown in these benches previously, the benches should be thoroughly cleaned and scrubbed out so as to get all insects, eggs, etc., away. Also, all the soil or surface of the house underneath should be scraped very carefully and swept out clean, and practically all the inside of the house thoroughly cleaned. When this is done, take two or three lumps of stone sulfur or brimstone and burn it in the house, preferably in the afternoon while the sun is still hot. As soon as the sulfur is set on fire and burning sufficiently, shut up the house as tight as possible and leave it till the next morning. After this the benches should be thoroughly washed with hot lime over the entire inside surface. The house is then ready for the new soil to be put in. This should be composed of good fresh loamy soil, preferably of a rather heavy texture; to each part of manure add 3 or not more than 4 parts of soil, the whole thoroughly fined and all lumps broken up. This compost should be prepared some time in advance and be turned over several times before it is wanted for the greenhouse. If this has been done, all that is necessary now is to bring in sufficient soil to fill the benches. Level it all over without treading or pressing in any form; then start to fill the house with plants. For the ordinary varieties such as Bride, Bridesmaid, in fact nearly all the Tea varieties, an average of 14–15 inches apart from plant to plant each way is about the right distance. When planting press the soil firmly around the ball of each plant and when the whole house is planted water the plants sufficiently to soak the soil to the bottom of the bench, but do not saturate the whole of the soil. It is far better to direct the water straight to each individual plant and then syringe the whole; this will moisten the other soil on the surface without making it unduly wet. Give all air possible to the plants day and night during hot weather. Syringe in very hot weather twice a day if it is necessary to keep humidity in the house and get the plants started into clean, vigorous growth. This treatment can be followed for four or five weeks until the plants begin to start their roots into the new soil; then go over the whole of the benches and press the soil as firmly as possible. Be careful not to break the plants in doing so, but it is absolutely necessary that the soil should be thoroughly settled and firm. After this, rake the whole surface over with a blunt-pointed rake so as just to make it level, water as before and as soon as the plants recover from this; in other words, as soon as they show they are starting new growths mulch the soil with a little manure, but in putting on the mulch never exceed half an inch at a time, as the plants need air at the roots as they do at the tops.

If the flowers are not wanted early, it is better to pinch all the buds off the plants as fast as they appear up to the end of September. This gives the plants an opportunity to make strong, sturdy growth and build up a constitution equal to withstand the pressure of winter forcing.

As the fall approaches and cooler nights come on, the air should be reduced proportionately at night, although it is better to maintain a little night ventilation as long as possible, even if it is necessary to use a little fire heat to expel the damp. After the plants begin to bloom they will need careful watching, as the days will be getting shorter and somewhat cloudy. It is important to avoid overwatering, but, at the same time, they should never be allowed to suffer for the want of moisture. Syringing should be done more carefully at this season of the year, or black-spot and various other diseases may appear.

To obtain the best class of flowers during the entire winter the average night temperature should not be allowed to exceed 56° on bright warm days. Of course with an abundance of air on, the temperature can be allowed to run up to 75°, 80° or even 90° on some very bright warm days.

Mildew, which is one of the worst pests of greenhouse grown Roses in the fall of the year, can be largely avoided by an abundance of air at all times. Should it make its appearance, sulfur on the heating pipes is the best remedy that can be applied. Red spider also will become troublesome if the plants are allowed to get dry in any spots, or too high a temperature is carried. This can be avoided by liberal syringing on all bright days, thoroughly soaking the under side of all the foliage.

If the greenhouses are constructed to grow plants on the solid bed instead of raised benches, the same method of cultivation should be followed and not more than 5 or 6 inches of soil should be used on the surface; have a thoroughly drained border; in all other respects cultivation would be the same as for bench system. After the plants get into thorough, strong, vigorous growth and producing abundance of flowers, say from Christmas onwards, a mulching of well-decomposed manure every five or six weeks in very limited quantities will be beneficial, and if the plants have made extra strong growth and all the soil is occupied with roots in the benches towards the end of February, liquid manure can be applied once in very three or four weeks with considerable benefit. This treatment should carry the plants successfully through to the end of their blooming season.

If the plants are kept in good, healthy, vigorous condition they could be carried through for a second season's work if necessary. To do this it would be necessary to dry them off somewhat, say through July and part of August for four to six weeks, so as to ripen the wood thoroughly without wilting the leaves completely. Then they could be pruned back to good, sound, plump eyes at the base of the strong shoots and all the small spray growth cut out. Then the plants can be lifted with a good ball of earth, so as to save as much of the roots as possible, replanted into new soil, and practically treated the same as young stock.

If grafted stock is preferred instead of own-root cuttings as above described, they can be treated according to regular instructions given by many authorities on grafting. Cultivation of these is in all respects identical with the above, except as to the rooting of the cuttings.

JOHN N. MAY.

ROSE ACACIA. *Robinia hispida.*

ROSE APPLE. *Eugenia Jambos.*

ROSEBAY. Same as Oleander. See *Nerium*. *Epilobium angustifolium* is sometimes called *Rosebay*.

ROSE CAMPION. *Lychnis Coronaria.*

ROSE, CHRISTMAS. *Helleborus niger.*

ROSE, JAPANESE. *Kerria Japonica.*

ROSE MALLOW. *Hibiscus.*

ROSEMARY or OLD MAN. See *Rosmarinus.*

ROSE OF CHINA. *Hibiscus Rosa-Sinensis.*

ROSE OF HEAVEN. *Lychnis Cœli-rosa.*

ROSE-OF-JERICHO is *Anastatica Hierochuntica.* See *Resurrection Plants.*

ROSE OF SHARON. *Hibiscus Syriacus.*

ROSE, ROCK. *Cistus* and *Helianthemum.*

ROSE, SUN. *Helianthemum.*

ROSIN PLANT. *Silphium.*

ROSIN WEED. *Silphium laciniatum.*

2190. A forcing Tea Rose — Mrs. W. C. Whitney (× ⅓).

ROSMARÌNUS (Latin, *sea-dew;* the plant is common on the chalk hills of the south of France and near the seacoast). *Labiàtæ.* ROSEMARY is a nearly hardy subshrub, with aromatic leaves which are used for seasoning. It has small, light blue flowers, which are much sought for by bees. Oil of Rosemary is a common preparation in drug stores. It is a volatile oil distilled from the leaves. The lvs. are also used in making Hungary water. In northern herb gardens it lasts for years if given well-drained soil and some winter protection. Franceschi recommends it for hedges in S. Calif., especially for dry and rocky places near the coast.

Generic characters: calyx 2-lipped; posterior lip concave, minutely 3-toothed; anterior 2-cut; corolla with posterior lip erect, emarginate, anterior lip spreading, 3-cut, the middle lobe longest, concave, declined: perfect stamens 2; style 2-cut at apex. The genus is placed near Salvia, being distinguished by the calyx being only shortly 2-lipped, not hairy in the throat and the connective of the anthers continuous with the filament and indicated only by a slender reflexed tooth.

officinàlis, Linn. ROSEMARY. OLD MAN. Shrub, 2–4 ft. high: lvs. numerous, linear, with revolute margins: fls. axillary, in short racemes, borne in early spring. Mediterranean region. V. 3:61. W. M.

ROTHRÓCKIA (Prof. J. T. Rothrock, head of Pennsylvania forestry dept., and author of the botanical part of Wheeler's U. S. geological surveys of the region in which the plant was discovered). *Asclepiadàceæ.* A genus of a single species, a perennial herb, with somewhat woody stems, spreading and twining: lvs. woolly: fls. in loose racemes, in axils of the lvs.: follicles 4–5 in. long, glabrous, fusiform, often used as a vegetable where native: corolla rotate, deeply 5-cleft; crown simple, inserted at the junction of corolla and stamen-tube, 5-parted; stigma abruptly produced from the top into a column having a 3-crested apex. Syn. Flora N. Amer., vol. 2, part 1, p. 403.

cordifòlia, A. Gray. Lvs. opposite, slender-petioled, cordate, acutely acuminate: fls. white or whitish, in racemes; corolla-lobes 3–4 lines long. Along water-courses near the borders of Arizona. Cult. in S. Calif.

F. W. Barclay.

ROUGE PLANT. *Rivina humilis.*

ROÙPALA (probably a native name in Guiana). Also spelled *Ropala*, *Rhopala*, etc. *Proteàceæ.* A genus of about 40 species of the tropical regions of S. America. They are mostly woody plants, with handsome evergreen lvs., either simple or pinnate: fls. usually inconspicuous, in axillary or lateral racemes, pedicelled in pairs, hermaphrodite, regular; perianth cylindrical, rather straight, but little dilated at the base; the limb somewhat globular: ovary sessile; ovules 2, pendulous, orthotropous.

A. *Hairs rust-colored.*

Pòhlii, Meisn. (*R. Corcovadénsis*, Hort.). A tree, with branches clothed with rusty colored woolly tomentum: lvs. 1 ft. or more long, pinnate, with 5–8 pairs of lfts. which are 3–5 in. long, on stout petiolules 1 in. or less long, ovate or obliquely ovate, acuminate, acutely serrate: fls. ⅛ in. long, white or yellowish, in nearly sessile axillary racemes 3–5 in. long. B.M. 6095.

AA. *Hairs golden.*

aùrea, Linden. According to Belg. Hort. 1866:202, this species was named for the golden hairs covering the upper parts of the stem and petioles. Brazil.—Rare and imperfectly known, but still offered in America.

R. Jónghei, Hort., is a plant offered by Siebrecht which does not appear in botanical works.

F. W. Barclay.

ROWAN. *Sorbus Aucuparia.*

ROYAL CROWN. *Eucomis.*

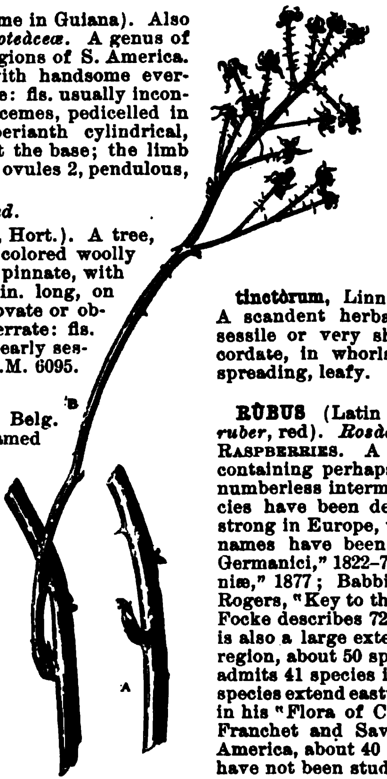
ROYAL FERN. *Osmunda regalis.*

ROYAL PALM. *Oreodoxa regia.*

ROYAL PEACOCK FLOWER. *Poinciana regia.*

ROYÈNA (Adrian van Royen, professor of botany in Univ. of Leyden; died 1779). *Ebenàceæ.* *Royena lucida* is one of the old-time Cape shrubs formerly cult. under glass for ornament in England and lately offered in S. California. It has small white fls. about ⅓ in. across, with 5 more or less reflexed lobes. Royena is a genus of about 13 species of evergreen shrubs or small trees, 2 of which are native to tropical Africa and the rest to the Cape. The genus is distinguished from the 4 or 5 other genera of the ebony family by the flowers being hermaprodite instead of diœcious and the stamens in a single series. Other generic characters (taken from the Flora of Tropical Africa): calyx often accrescent in fruit; lobes 5, rarely 4; corolla bell- or urn-shaped, 5-cleft; lobes reflexed; stamens 10, inserted at the base of the corolla-tube: ovary conical; styles or style-branches 2–4: fr. globose to oblong, leathery, indehiscent.

lùcida, Linn. Tender shrub: lvs. ovate, the younger ones silky: peduncles about a third as long as the lvs.: corolla bell-shaped. S. Africa. B.R. 32:40.



2191. To illustrate the fruit-bearing of the black Raspberry.

If the main cane or stem on the left grew in 1899, the fruit-bearing shoot (B) grew in 1900; and at the close of the season of 1900, the whole cane had died or become very weak. If the cane had been examined in the spring of 1900, the bud would have been seen (as above A) from which was to grow the fruit-bearing shoot.

RUBBER PLANTS. Various plants furnish Rubber. The best gutta percha is said to be produced by *Isonandra Gutta* (which see), a native of India. For the Rubber Tree of South America, see *Hevea Brasiliensis*, p. 741. The Rubber Tree of tropical Africa is *Landolphia florida;* see B.M. 6963. The Rubber Plant of horticulturists is *Ficus elastica.*

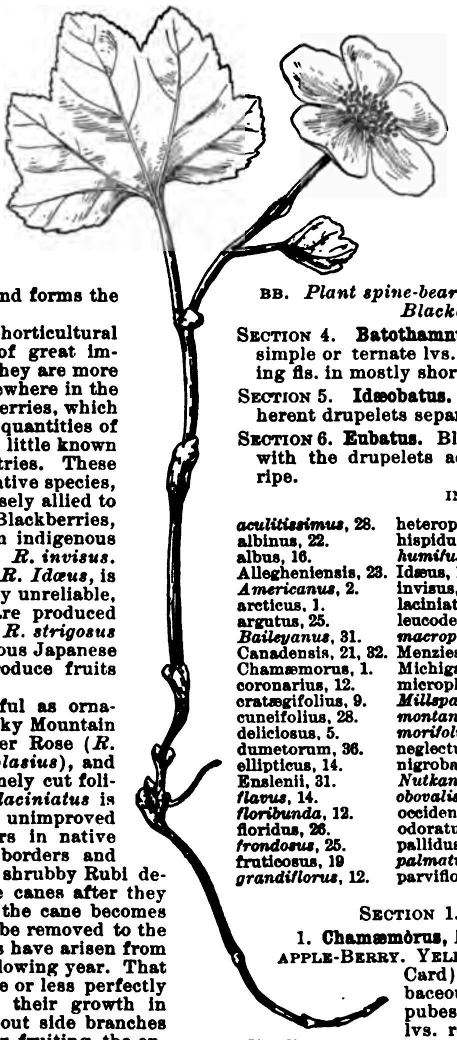
RÙBIA (Latin, *red;* referring to the color of the dye extracted from the root). *Rubiàceæ.* *R. tinctorum* is the dye-plant called Madder, the long, fleshy roots of which are ground to powder. According to Thorburn, Madder furnishes a good green fodder if cut the second year when in flower. The genus consists of about 30 species of scabrous, hispid or prickly herbs widely scattered about the world, mostly in the temperate regions. Lvs. in whorls of 4–8 or rarely opposite: lvs. small to minute, in axillary or terminal cymes, 5-merous; involucre none; calyx-limb wanting; corolla rotate or rotate-bell-shaped, 5-lobed: ovary 2-loculed or abortively 1-celled.

tinctòrum, Linn. (*R. tinctòria*, Salisb.). Madder. A scandent herbaceous perennial: lvs. 2–4 in. long, sessile or very short-petioled, mostly lanceolate, not cordate, in whorls of 4–6: cymes terminal, panicled, spreading, leafy.

F. W. Barclay.

RÙBUS (Latin name, ultimately connected with *ruber*, red). *Rosàceæ.* Bramble. Blackberries and Raspberries. A most variable and puzzling genus, containing perhaps 200 fairly well-marked species and numberless intermediate forms.. As many as 1,500 species have been described. The genus is particularly strong in Europe, where the greatest number of specific names have been made (see Weihe & Nees, "Rubi Germanici," 1822–7; Focke, "Synopsis Ruborum Germaniæ," 1877; Babbington, "British Rubi," 1869; W. M. Rogers, "Key to the British Rubi," Journ. Botany, 1892). Focke describes 72 species inhabiting Germany. There is also a large extension of the genus in the Himalayan region, about 50 species being recognized (J. D. Hooker admits 41 species in the "Flora of British India"). The species extend eastward into China and Japan. Hemsley, in his "Flora of China," admits 41 species. In Japan, Franchet and Savatier admit 22 species. In North America, about 40 species are now recognized, but they have not been studied critically, and it is probable that many more specific types will be recognized in the near future. No end of species could be made, but it is doubtful whether a great multiplication of species-names would contribute anything more than confusion to the literature and knowledge of the genus. There is no monograph of the American species. The species that are valuable for their fruits are reviewed by Card in "Bush-Fruits" and by the present writer in "Sketch of the Evolution of our Native Fruits," 1898. Rubus is widely distributed in the northern hemisphere, particularly in temperate and warm-temperate parts. Some of them are alpine and arctic. In tropical countries the genus is relatively poorly represented. Oliver admits only 4 in the "Flora of Tropical Africa." Only 2 species are described in Grisebach's "Flora of the British West Indies." Baker admits 3 species in the "Flora of Mauritius and the Seychelles." Hillebrand describes 3 species in "Flora of the Hawaiian Islands." The southern hemisphere has few species. Bentham's "Flora Australiensis" has but 5 species. Kirk's "Flora of New Zealand" mentions only 4 indigenous species. There are also 5 species described in Harvey and Sonder's work ("Flora Capensis") on the flora of the Cape of Good Hope region.

Rubus is closely allied to Rosa, from which it differs chiefly in the structure of the flower. In Rosa, the torus is hollow (formerly said that the calyx is hollow or urn-shaped) and contains the dry fruits or akenes. In Rubus the torus is convex, conical or elongated, and bears the mostly soft or pulpy fruits on its surface. Rubi are chiefly shrubs with stems (canes) that die after one or two years, but some of them have herbaceous tops. Most of them are more or less prickly. Many of the species are creeping, decumbent or half-climbing. Leaves simple or compound, alternate, the compounding on the pinnate order and the leaflets mostly 3 (several in some of the tropical and oriental species). The flowers are mostly white or rose-colored, usually in corymbs or racemes but sometimes solitary; calyx 5-parted, the lobes persistent; petals 5, usually obovate; stamens many, inserted on the calyx-rim or torus-rim; pistils many, closely packed on the torus, usually becoming drupelets but sometimes dry when ripe. The drupelets are usually more or less coherent at maturity, the collective body forming the "fruit" or "berry" of horticulturists. In the Raspberries, the coherent drupelets separate from the torus at maturity, causing the berry to be hollow or concave on the under side. In the Blackberries, the coherent drupelets also adhere to the torus, which separates at maturity and forms the "core" of the berry.



2192. Cloudberry—Rubus Chamæmorus. Natural size.

Relatively few of the Rubi have horticultural merit, although some of them are of great importance. As pomological subjects they are more important in North America than elsewhere in the world. Here we grow not only Raspberries, which are popular elsewhere, but also great quantities of improved Blackberries, a fruit that is little known as a cultivated product in other countries. These Blackberries are the product of our native species, *R. nigrobaccus* being the chief. Closely allied to them are the Dewberries or trailing Blackberries, which also have been developed from indigenous species, chiefly from *R. villosus* and *R. invisus*. Although the European Raspberry, *R. Idæus*, is grown in North America, it is mostly unreliable, and the leading commercial sorts are produced from the native *R. occidentalis* and *R. strigosus* and from hybrids of the two. Various Japanese species, recently introduced, also produce fruits of value.

A number of the species are useful as ornamental subjects, particularly the Rocky Mountain *R. deliciosus*, the old-fashioned Brier Rose (*R. rosæfolius*), Wineberry (*R. phœnicolasius*), and *R. cratægifolius*. For its graceful, finely cut foliage, and sometimes for its fruit, *R. laciniatus* is occasionally grown. Some of the unimproved native species are offered by dealers in native plants as worthy subjects for wild borders and rock gardens. The beauty of most shrubby Rubi depends largely on the removal of the canes after they have bloomed once. After flowering, the cane becomes weak or may die outright. It should be removed to the ground. In the meantime other canes have arisen from the root, and these will bloom the following year. That is, the stems of Rubi are usually more or less perfectly biennial: the first year they make their growth in stature; the second year they throw out side branches on which the flowers are borne; after fruiting, the entire cane becomes weak or dies (Fig. 2191). Removing these canes not only contributes to conserve the vigor of the plant, but it also adds to its appearance of tidiness. These remarks apply with particular force to the cultivation of Raspberries, Blackberries and Dewberries. For other accounts of Rubi, see *Blackberry*, *Dewberry*, *Loganberry*, *Raspberry*.

Focke (Engler & Prantl, "Die Natürlichen Pflanzenfamilien") divides the genus Rubus into 11 sections, seven of which are concerned with the species to be described in this work. These seven are as follows:

A. *Herbaceous species: flowering shoots arising from the crown of the plant.*

SECTION 1*a*. **Dalibarda.** Stamens about 5: fr. scarcely juicy: fls. perfect, on creeping leafy stems: lvs. simple, not lobed. The present writer prefers to consider Dalibarda as a distinct genus, and it is so treated on p. 453 of this work.

SECTION 1. **Chamæmorus.** Stamens numerous: fr. juicy: fls. diœcious, borne singly on upright leafy stalks: lvs. simple, lobed. The Cloud-berry or Bake-apple Berry, of arctic or subarctic regions, and much prized for its fruits, belongs here.

SECTION 2. **Cylactis.** Fls. perfect or polygamous, singly or several together at the ends of the shoots: lvs. ternate or pediform (5-parted), or sometimes only lobed.

AA. *Shrubby species: flowering shoots arising from woody canes of 2 or more years' growth.*

B. *Plant spineless.*

SECTION 3. **Anoplobatus** (*batus* is Greek for bramble). Upright rather soft-wooded shrubs, usually with shreddy bark: large, lobed lvs., large erect fls., and broad torus.

BB. *Plant spine-bearing (exceptions in some Blackberries).*

SECTION 4. **Batothamnus.** Upright shrubs, with simple or ternate lvs., small leaflets and drooping fls. in mostly short clusters.

SECTION 5. **Idæobatus.** Raspberries, with the coherent drupelets separating from the torus.

SECTION 6. **Eubatus.** Blackberries and Dewberries, with the drupelets adhering to the torus when ripe.

INDEX.

aculitissimus, 28.
albinus, 22.
albus, 16.
Allegheniensis, 23.
Americanus, 2.
arcticus, 1.
argutus, 25.
Baileyanus, 31.
Canadensis, 21, 32.
Chamæmorus, 1.
coronarius, 12.
cratægifolius, 9.
cuneifolius, 28.
deliciosus, 5.
dumetorum, 36.
ellipticus, 14.
Enslenii, 31.
flavus, 14.
floribunda, 12.
floridus, 26.
frondosus, 25.
fruticosus, 19
grandiflorus, 12.
heterophyllus, 24.
hispidus, 30.
humifusus, 31.
Idæus, 15.
invisus, 33.
laciniatus, 20.
leucodermis, 18.
macropetalus, 35.
Menziesii, 11.
Michiganensis, 32.
microphyllus, 8.
Millspaughii, 21.
montanus, 23.
morifolius, 10.
neglectus, 17.
nigrobaccus, 22.
Nutkanus, 7.
obovalis, 30.
occidentalis, 18.
odoratus, 6.
pallidus, 18.
palmatus, 8.
parviflorus, 7.
phœnicolasius, 13.
pomponius, 19.
Potanini, 3.
Randii, 27.
roribaccus, 32.
rosæflorus, 12.
rosæfolius, 12.
sativus, 22.
Savatieri, 10.
sempervirens, 30.
setosus, 29.
Sinensis, 12.
sorbifolius, 12.
spectabilis, 11, 19.
strigosus, 16.
suberectus, 25, 29.
trifidus, 4.
triflorus, 2.
trivialis, 34.
ursinus, 35.
villosus, 22, 32.
vitifolius, 35.
xanthocarpus, 3.

SECTION 1. CHAMÆMORUS.

1. **Chamæmòrus**, Linn. CLOUDBERRY. BAKE-APPLE-BERRY. YELLOW BERRY. Fig. 2192 (after Card). Creeping: branches herbaceous, covering the ground, pubescent or almost glabrous: lvs. round-cordate or reniform, shallowly 3- to 5-lobed, finely dentate: fls. large and white, on solitary terminal peduncles: fr. large, globular, red or yellowish, composed of few soft drupelets, edible. Entirely across the continent in high northern regions, and reaching as far south, in the East, as the high land of Maine and N. H.; also in Eu. and Asia.—The Cloudberry is an inhabitant of peat bogs. It grows within the arctic zone. It is much prized for its fruit, which is gathered from the wild in large quantities. It is sometimes planted farther south as a rock garden plant. *R. arcticus*, Linn., a pink-fld. species with trifoliolate lvs., occurs in nearly the same range, and produces small edible berries. This species belongs to Section 2.

SECTION 2. CYLACTIS.

2. **triflòrus**, Rich. (*R. Americànus*, Britt.). Stems slender and trailing, 1–2 ft. long, herbaceous, without

2193. Rubus deliciosus, from the Rocky Mountains.

prickles, glabrous or nearly so: lvs. thin and soft, light green, with 3 or 5 ovate or rhombic-ovate, coarsely serrate lfts.: fls. 1–3 on each peduncle, small and white, the calyx reflexed: fr. small, reddish. Cold swamps, N. J. west and north.—Offered as a rock garden plant for moist places.

3. **xanthocárpus**, Bur. & Franchet (*R. Potanini*, Regel). Trailing, the stems dying back every year, the stems pilose and weak-spiny; lvs. pinnately 3-foliolate, the leaflets ovate, acute or obtuse, strongly and unequally dentate, the terminal one twice larger than the others: fls. solitary or twin in the axils of the upper lvs., the peduncle and calyx weak-prickly, the petals white: fr. large, ovate, bright yellow, fragrant and palatable, the calyx persistent China; discovered in 1885 in the Province of Kansu, 40° north latitude, and later found in provinces Sze-Chuen and Yun-nan.—Int. into the U. S. in 1898 by the Dept. of Agric. through Professor N. E. Hansen, to be tried for its edible raspberry-like fruit. At Brookings, S. Dakota, the plants suffered from the phenomenal winter of 1898–9, but mulched plants have subsequently endured the winters well.

SECTION 3. ANOPLOBATUS.

A. *Lvs. mostly 7-lobed.*

4. **trifidus**, Thunb. FIRE RASPBERRY. Strong-growing and erect, 7–10 ft. tall: lvs. large, palmately ribbed, 3–5- or even 7-cleft, serrate: fls. subsolitary, the peduncles villous: berry of medium size, scarlet, with pointed drupelets. Japan.—Sparingly introduced, and prized for its bright autumn foliage (whence the name "Fire Raspberry").

AA. *Lvs. 5- or less-lobed.*

B. *Peduncles mostly 1-fld.*

5. **deliciósus**, James. ROCKY MOUNTAIN FLOWERING RASPBERRY. Fig. 2193. Compact, bushy grower, reaching 5 ft.: lvs. large, orbicular or reniform, shallowly 3–5-lobed, unequally serrate, somewhat glandular: fls. borne in great profusion, pure white, 1–2 in. across, in early summer and continuing for a long season: berry hemispherical, purplish or wine-color, with large, soft drupelets like those of a red Raspberry, edible but not esteemed for eating. Rocky Mountains, reaching 8,000 ft. elevation. B.M. 6062. G.C. II. 15:537. R.H. 1882, p. 356. F.S. 23:2404. Gn. 18:253; 29, p. 336; 34, p. 231; 45, p. 74; 46, p. 293. Gt. 47:1451. Gng. 3:325. G.M. 41:508. —One of the finest of native flowering Raspberries, and deserving to be known. Hardy in Mass. The fls. resemble single roses.

BB. *Peduncles several- to many-fld.*

6. **odorátus**, Linn. FLOWERING RASPBERRY. MULBERRY (erroneously). Fig. 2194. Strong-growing plant, with the shreddy canes reaching 3–6 ft.: lvs. very large, pubescent beneath, 3–5-lobed, the lobes pointed, margins serrate: fls. 1–2 in. across, rose-purple, several to many in the cluster, the sepals with a long point, the peduncles and pedicels glandular-pubescent: berry flattish and broad (¾ in. across), rather dry, light red, edible but not valued. Nova Scotia to Mich. and Georgia (Fla. ?). Gn. 34, p. 230. B.M. 323. J.H III. 31:133.—Prefers rich shady woods and banks. It makes a bold subject in a foliage mass, and its fls. are nearly as large as single roses, although the color is less bright. It spreads rapidly from the root and overtops weaker plants.

7. **parviflòrus**, Nutt. (*R. Nutkànus*, Moç.). Differs from the last in having white fls. in few-fld. clusters and less glandular peduncles. N. Mich. to the Pacific coast and southward in the Rockies: the western representative of *R. odoratus*. B.M. 3453. B.R. 16:1368. Gn. 45, p. 75.

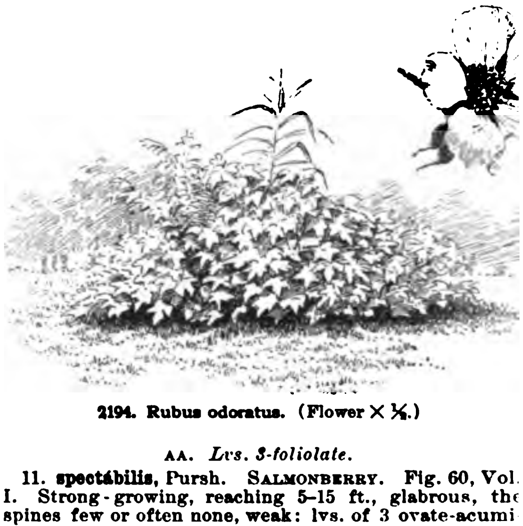
SECTION 4. BATOTHAMNUS.

A. *Lvs. simple, but more or less lobed.*

8. **microphýllus**, Linn. f. (*R. palmàtus*, Thunb.). Spreading, often slender-stemmed plant growing 4 or 5 ft. tall, with many short, but stout nearly straight spines: lvs. rather small, 2–3 in. long as a rule, narrow-ovate-acuminate or sometimes nearly triangular-ovate-acuminate, rather deeply 3–5-lobed and the middle lobe long and acuminate, the margins very sharp-serrate: fls. white, nearly or quite ¾ in. across, with broadly ovate petals: fr. small (red ?), of little value. Japan.—Sparingly introduced as an ornamental plant, but little known here. The "Mayberry," introd. by Luther Burbank, is said to be a hybrid between this species and the Cuthbert Raspberry (*R. strigosus*). The Mayberry is described as producing a large yellow edible berry, ripening in advance of the Strawberry.

9. **cratægifòlius**, Bunge. Fig. 2195 (after Card). Strong, erect or diffuse much-spreading plant (3–5 ft.), with terete reddish glabrous canes that bear few and small straight spines: lvs. oblong-ovate to cordate-ovate, acuminate, 3–5-lobed, and the margin coarsely serrate and notched: fls. white, in small clusters terminating slender leafy shoots, about ½ in. across: fr. small, orange-red, of no value. Japan.—An excellent plant for holding banks and for covering waste places, and giving fine deep reds in the fall. Perfectly hardy in central New York. Burbank's "Primus" is hybrid of this and *R. vitifolius*, the latter furnishing the seed.

10. **Savatièri** (*R. morifòlius*, Sieb., Franch. & Savat. Enum. Pl. Jap. (1875), not Muell. 1858). Differs from *R. cratægifolius* by its more numerous and stronger prickles, the leaves villous beneath and deeply cordate at base, shorter petioles and shorter and thicker pedicels. Southern Japan.—Offered by dealers in Japanese plants, who speak of its pretty fruit ripening in July.



2194. Rubus odoratus. (Flower × ⅓.)

AA. *Lvs. 3-foliolate.*

11. **spectábilis**, Pursh. SALMONBERRY. Fig. 60, Vol. I. Strong-growing, reaching 5–15 ft., glabrous, the spines few or often none, weak: lvs. of 3 ovate-acuminate lfts., which are doubly serrate toothed and some

times indistinctly lobed, long-stalked, thin, glabrous or becoming so beneath: fls. solitary or in 2's, large, red or purple: fr. large, somewhat conical, salmon-color or wine-red, edible, the drupelets bearing the persistent styles. Calif. to Alaska. B.R. 17:1424. L.B.C. 17:1602. F.S. 21:2260. Mn. 4, p. 57.—Sometimes cult. for its showy flowers and fruits. Canes perennial. Var. **Ménziesii**, Wats., has tomentose leaves.

SECTION 5. IDÆOBATUS, or *Raspberries.*

A. *Lvs. long-pinnate, with 2 or more pairs of narrow leaflets.*

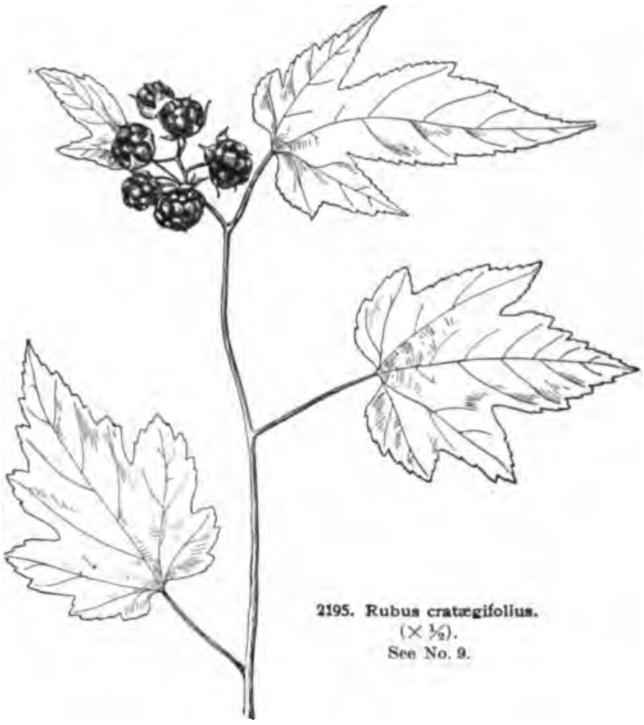
12. **rosæfòlius**, Smith (*R. floribúnda* and *R. Sinénsis*, Hort. *R. rosæflòrus*, Roxbg.). STRAWBERRY-RASPBERRY, Figs. 2196, 2197. Erect and tall-growing, evergreen in warm countries, glabrous or somewhat pubescent-hirsute: lvs. odd-pinnate, the lateral leaflets 2–7 pairs, all the lfts. ovate-lanceolate or lance-oblong, acuminate, strongly many-veined and very sharp-serrate, more or less silky-hairy beneath: fls. solitary or in few-fld. clusters, white, 1½–2 in. across, showy: fr. erect, bright red, long thimble-shaped, usually about 1–1½ in. high, very showy, edible but insipid. Var. **sorbifòlius** (*R. sorbifòlius*, Maxim.) is a very hairy and hispid form. Var. **coronàrius**, Sims (*R. grandiflòrus*, Hort.), is a double form, sometimes cult. as the "Brier Rose" and "Bridal Rose" (B.M. 1733. G.C. II. 11:77).—Widely distributed in tropical countries, but native to the Himalayan region and eastward to China and Japan. B.M. 6970. F.S. 17:1714. A.G. 20:82, 87. A beautiful plant and worthy of general culture. In the North it usually kills to the ground each winter, but it throws up shoots 2–4 ft., and these bloom from summer until frost, usually ripening fruit at the same time. The fruit has some value for eating, but it is probable that it will never be greatly developed in this direction. The double-flowered form is often grown under glass and in pots.

AA. *Lvs. pedately 3–5-foliolate.*

B. *Plant profusely red-hairy.*

13. **phœnicolàsius**, Maxim. WINEBERRY. Fig. 2198. Canes long and recurving, furnished with straight, weak prickles and densely clothed with red-brown glandular hairs, propagating by "tips": lfts. usually 3, broad-ovate to round-ovate, apiculate-toothed and sometimes indistinctly lobed at top, white-tomentose beneath: fls. in dense, small shaggy-haired clusters which spring from the uppermost axils and form a large, loose, leafy panicle; petals shorter than the long, bristly calyx-lobes, the latter enlarging after flowering and inclosing the growing fruits in a bur but spreading apart as the fruit matures: fr. usually small and soft, cherry-red, acid or usually insipid. Japan and China. B.M. 6479. G.C. II. 26:365; III. 11:269; 28:137. J.H. III. 29:210. A.G. 12:205; 15:435. Gng. 3:263.—Interesting as an ornamental plant, and also recommended for its fruit. In the North it often kills to the ground, but the strong young recurving canes and white-bottomed foliage make it a handsome plant.

2196. Rubus rosæfolius.
One of the best of the flowering Rubuses.



2195. Rubus cratægifolius. (× ½). See No. 9.

14. **ellipticus**, Smith (*R. flàvus*, Ham.). Fig. 2199. Tall and erect or nearly so (6–10 ft.), the canes stout and densely beset with straight red-brown hairs and bearing a few stout, short, nearly straight prickles: lfts. 3, the terminal one much the largest, ovate to orbicular-ovate, not lobed, evenly doubly serrate, thickish, soft pubescent and strongly veined and prickly on the midrib beneath: fls. white, ½ in. or less across, in small, many-fld. clusters: berry the size of a common Raspberry, yellow, of good quality. Himalayas.—Grown in southern Fla., where it is said to be the only Raspberry that perfects its fruit.

BB. *Plant not red-hairy all over.*

C. *Red Raspberries.*

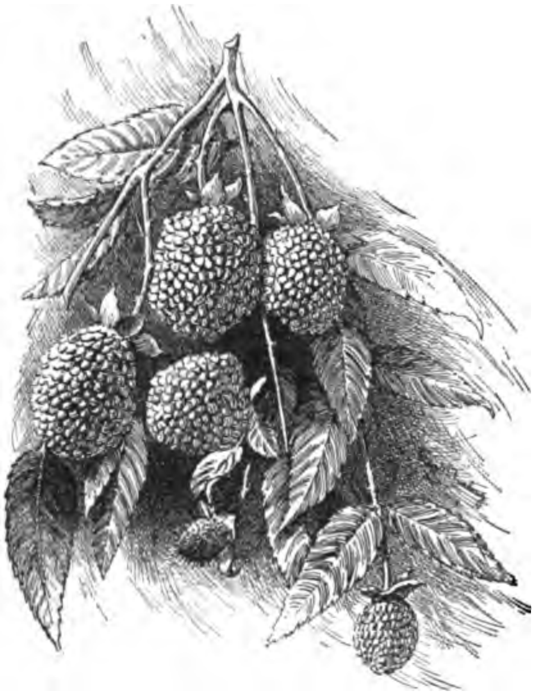
15. **Idæus**, Linn. EUROPEAN RASPBERRY. An erect, mostly stiff grower, propagating by suckers, the canes light-colored and bearing nearly straight slender prickles: lfts. ovate, white beneath, irregularly toothed and notched, usually somewhat plicate or wrinkled: flower-clusters mostly long and interrupted, most of the peduncles dividing into two or three pedicels, the pedicels, as also the flowering shoots, petioles and midribs, finely pubescent, but not glandular, and sparsely furnished with firm recurved prickles: fls. small, white; calyx pubescent: fruit oblong or conical, dark red, yellow or whitish, produced more or less continuously throughout the season. Europe and Asia.—Named for Mt. Ida, in Greece. Early introduced into this country, but now nearly driven from cultivation by the hardier native species. The Antwerps, Fontenay, and Fastolf belong here. *Rubus Idæus* itself is not known to be native to N. Amer., but a most interesting form of it (var. *anomalus*, Arrh.) has been discovered recently in Vermont. See Fernald, Rhodora, 2, p. 195, with figure.

16. **strigòsus,** Michx. (*R. Idæus*, Linn., var. *strigòsus*, Maxim.). Red Raspberry. Fig. 2080. Much like the last, but distinguished by a more slender and open habit, stiff prickles on the bearing bristly canes, which are brown and somewhat glaucous, thinner leaves, and gland-tipped hairs or bristles upon the flowering shoots, petioles and calyx, the latter less pubescent or hirsute: flower-clusters more open or scattered: fruit bright light red, or rarely yellow or whitish, not produced continuously. Widely spread in the northern states as far west as Missouri, also in the mountains to Arizona and northward to Alaska, extending farther north than the Blackcap; also in Asia.—Under cultivation the glandular hairs usually disappear. The light red garden berries, like Cuthbert, belong here. Var. **álbus,** Fuller, has amber-white fruits.

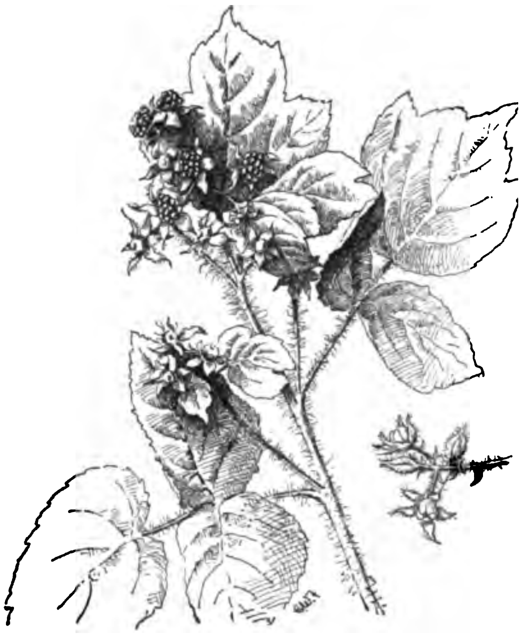
17. **negléctus,** Peck. Purple-Cane Raspberries. Figs. 2082, 2200. A large and variable race of hybrids between *R. strigosus* and *R. occidentalis* occurs both naturally (*Rubus neglectus*, Peck, 22d Rep. Reg. N. Y. State Univ. 53, 1869) and in the garden (Bailey, Amer. Gard. 11:721, 1890). These plants propagate either by "tips" or suckers, usually by the latter. The flower-clusters are open and straggling, and the fruit ranges in color from yellow to purple. As a rule, the fruit is aggregated at the end of the cluster but is scattering below. The Purple Cane type of Raspberry belongs here. Prominent varieties are Shaffer, Philadelphia (now nearly out of cultivation), Gladstone, and probably Caroline.

cc. *Black Raspberries (yellow-fruited forms are known).*

18. **occidentàlis,** Linn. Common Blackcap. Figs. 2201, 2202. Strong, erect bush, the canes finally recurving and rooting at the tips, furnished with straight spines, glaucous, not bristly; lfts. broadly ovate, dull green above and white beneath, finely and sharply serrate, and notched, the petioles usually bearing short prickles: fls. in small, dense, prickly clusters with sometimes a few scattering pedicels, the petals shorter than the long-pointed whitish woolly sepals: fr. rather small, hemispherical, firm or even hard, black or occasionally amber-white, dry and sweet. Plentiful in field and clearings in the northern-eastern states to Orego and Brit. Columbia and southward to Ga. in the mountains, and to Mo.—In cultivation, known in many forms as Ohio, Gregg, etc. Var. **pállidus** has amber-yello fr.; sometimes found in the wild.



2197. Rubus rosæfolius (X ½).
Sometimes known as Strawberry-raspberry.



2198. Rubus phœnicolasius (X½). No. 13.

Var. **leucodérmis,** Card (*R. leucodérmis* Dougl. Lfts. more coarsely dentate-serrate, sometimes nearl incise-serrate, the prickles strong and more hooked: f reddish black or black. Rocky Mts. and W.

Section 6. Eubatus, or *Blackberries and Dewberrie*

The botany of the American Blackberries and Dewberries is interminably confusing. If the kind of sp cies-making that has been applied to the Europea Rubi were applied to the American, the number species would straightway be quadrupled or treble at the least. There is no difficulty in finding forn that are distinct enough to be described as specie The difficulty lies in the endless series of intermed ate forms, that confound all efforts at limitation ar make printed descriptions of no avail. This difficul is greatly increased from the fact that the folia often differs widely between the verdurous and flowe ing shoots of the same plant. There seems to be litt utility in separating forms that cannot be disti guished in at least a fair proportion of the specime that come to one's hand, however well marked th may be in their extremes. It is to be expected, ho ever, that long-sustained studies in the field, as w as in the herbarium, will discover means of separ ing some of the forms that are now confused, but is doubtful if there are any species in this section Rubus, as the term species is commonly understoo The best one can do is to throw them into grou For a history of nomenclatorial difficulties in Ame can Rubi, see "Evolution of Our Native Fruits."

a. *Blackberries: Plant usually erect or essentially (strong canes often recurring).*

Group 1. Exotic Blackberries, with mostly perenn canes and flowers usually borne on the ends of main shoots.

19. **fruticòsus,** Linn. European Bramble. Stro growing, mostly pubescent or hairy on the young par usually with strong recurved prickles, the canes oft

many feet long and recurving or half climbing but sometimes erect: lfts. 3–5, ovate or rhomb-ovate, coarsely toothed, thickish, pubescent to white-downy beneath; petioles and usually the midribs beneath bearing prickles: fls. in terminal panicles, white or pink, showy, the buds white-pubescent: fr. black or dull red, the calyx reflexed, edible but little prized. Europe, where it is common in fields and hedges. As a cult plant, known chiefly in the double-fld. form (as *R. pomponius*). Gn. 34, p. 234. Sometimes known as *R. spectabilis* in gardens.

2199. Rubus ellipticus (× ⅓). A yellow-fruited species from the Himalayas. No. 14.

20. **laciniàtus**, Willd. (*R. fruticòsus*, var. *laciniàtus*, Hort.). CUT-LEAVED OR EVERGREEN BLACKBERRY. Fig. 2203. A tall, straggling brsh with permanent or perennial canes in mild climates, and leaves more or less evergreen, the stems provided with recurved prickles: lfts. 3, broadly ovate in general outline, cut into several or many oblong or almost linear sharply toothed divisions, the ribs prickly below and the petioles strongly so; fls. in terminal panicles, white or blush, the calyx and pedicels pubescent or even tomentose: fr. usually thimble-shaped, late, black, often excellent. Gn. 21, p. 57; 45, p. 78.—This Blackberry is probably native to Europe, where it has been long known in gardens. It is apparently only a cut-leaved form of the common European *Rubus fruticosus*. It is now widely scattered, and seems to thrive particularly well in Hawaii and other Pacific islands and on the Pacific slope. By some it is supposed to be native to the South Sea Islands (see Bull. 64, Utah Exp. Sta.). It is probable that the plant has been introduced into the West from those sources, but such fact does not prove its original nativity. It has aroused considerable attention in Oregon and other parts of the West, and is often known as the Oregon Everbearing Blackberry. In mild climates the lower parts of the canes often live from year to year until they become as thick as one's wrist; and in such climates the leaves persist for the greater part of the winter. The plant has long been grown for ornament in the eastern states, but it has not attracted attention as a fruit-plant in this region. The fruits are of fair size and quality, and ripen from midsummer or late summer to October. The plant is a good ornamental subject, although it is likely to cause trouble by sprouting at the root.

2200. Rubus neglectus. (× ⅓.) The Caroline Raspberry. No. 17.

Group 2. Thornless Blackberries, with tall, nearly unarmed furrowed biennial canes, and long, open flower-clusters.

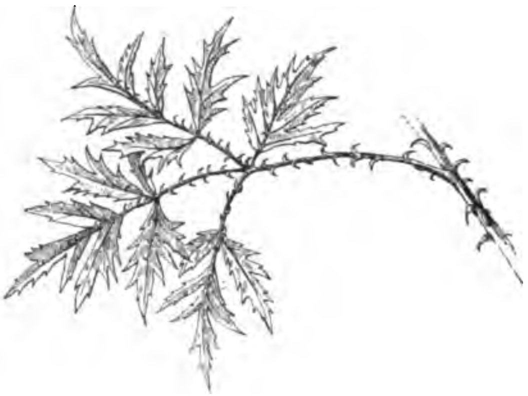
21. **Canadénsis**, Linn. (*R. Millspaughii*, Britt.). THORNLESS BLACKBERRY. Very tall and robust (sometimes reaching 10–12 ft. high), the canes nearly or quite spineless: lfts. narrow-ovate to ovate-lanceolate, long-acuminate, sharply and nearly evenly serrate; stipules usually prominent, narrow: fls. large, white, in long, open, raceme-like, nearly glabrous clusters, on slender spreading pedicels: fr. black, almost globular to short-oblong, usually juicy and good. Eastern Canada, through the high lands of New England, New York and Michigan to mountains of North Carolina.—Not in cultivation, except in botanic gardens and amateurs' collections.

2201. Rubus occidentalis (× ¼). The original of the cultivated Black Raspberries. No. 18.

Group 3. Glandular Blackberries, with stout, thorny biennial canes and prominently glandular-pubescent inflorescence.

22. **nigrobáccus**, Bailey (*R. villòsus*, Authors, not Ait.). COMMON HIGH-BUSH BLACKBERRY of the North. Figs. 2204–6. Canes tall, recurving at the ends, furrowed, the young parts prominently glandular-pubescent, the spines usually large and more or less hooked: lfts. 3–5, ovate-acuminate or sometimes lance-ovate, long-stalked (at least in the largest lvs.), the terminal one often heart-shaped at base, the margins nearly regularly strong-serrate, the under surface glandular-pubescent: fls. white, showy, the petals narrow, borne in a long, open raceme-like cluster of which the terminal flower is usually the oldest, each pedicel standing at nearly right angles to the rachis: fr. black, oblong (varying to nearly globular), usually not very juicy, sweet and aromatic. Everywhere in old fields and clearings in the northeastern states, at common elevations, extending south to North Carolina and west to Iowa, Kansas and Missouri.—Known in cultivation in the "Long-cluster Blackberries" as Taylor and Ancient Briton. Var. **albinus**, Bailey, the "White Blackberry," is a state in which the fruits are amber-colored and the bark yellowish green; occasionally as far west as Michigan, and probably farther.

Var. **sativus,** Bailey (*R. sativus,* Brainerd). Fig. 2207; also Fig. 237, Vol. I. Generally lower and the canes more erect: lfts. broader (or at least shorter) and less prominently pointed: fl.-clusters shorter (usually from the elongation of the lower pedicels or the upper ones remaining short): fr. rounder, and the drupelets usually relatively larger and juicier. Dry, open fields. —Distinct in its extreme forms, but running into the species by all manner of intermediate gradations. From this plant the common "Short-cluster Blackberries" of the garden appear to be derived, as Snyder, Kittatinny, Erie, etc.



2203. Rubus laciniatus (× ½). No. 20.

23. **Alleghenìénsis,** Porter (*R. villòsus,* var. *montànus* and *R. montànus,* Porter, not Wirtg.). Very like *R. nigrobaccus,* and perhaps only a mountain state of a cosmopolitan type: plant smaller, usually less prickly: branches and leaf-stalks usually reddish, and all young growths very glandular-pubescent: lvs. mostly smaller, very long-pointed, closer-toothed: fl.-clusters usually smaller: fr. small, long and narrow, tapering towards the top, the drupelets many and small, not very juicy but of good flavor. In mountains and highlands, Ontario to Virginia.—Common on the higher elevations, affording much edible fruit. In its typical form, as seen in the wild, it is very distinct from *R. nigrobaccus,* particularly in its fruit.

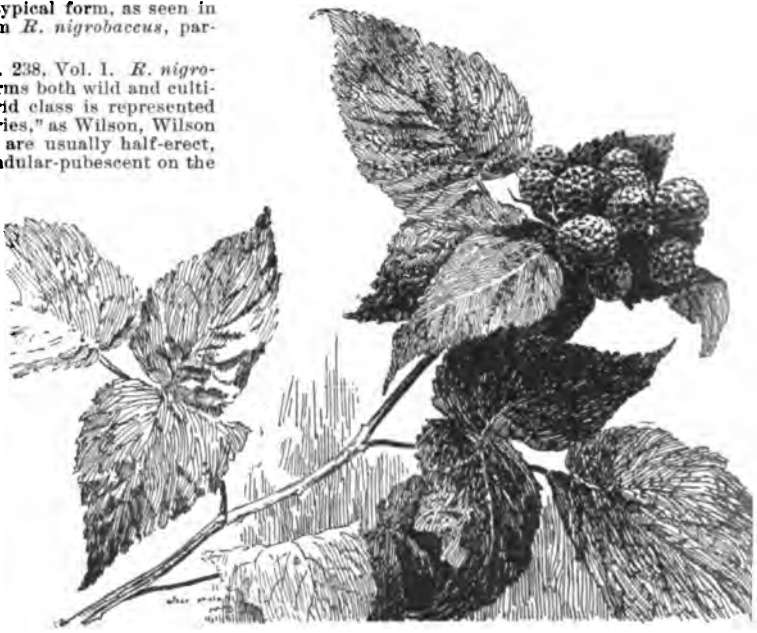
24. **heterophýllus,** Willd. Fig. 238, Vol. I. *R. nigrobaccus* × *R. villosus,* in many forms both wild and cultivated. In cultivation this hybrid class is represented by the "Loose-cluster Blackberries," as Wilson, Wilson Jr., and Rathbun. The plants are usually half-erect, thorny, mostly more or less glandular-pubescent on the young growths: lfts. broad and jagged: fl.-clusters small and usually forking, with long pedicels: fr. rather loose-grained, with large drupelets. The plant is not infrequent in regions in which both *R. nigrobaccus* and *R. villosus* grow. It is usually easily distinguished by the half-erect habit and irregularly toothed and jagged lfts. which are not long-acuminate. In some cases, the bushes naturally stand 3–4 ft. high.

Group 4. Leafy-cluster Blackberries, with little or no glandular pubescence and short flower-clusters that have more or less small lvs. intermixed.

25. **argùtus,** Link (*R. frondòsus,* Bigel. *R. villòsus,* var. *frondòsus,* Torr. *R. suberéctus.* Hook.). Fig. 2208. Very like *R. nigrobaccus* in habit, but usually stiffer in growth, the young parts and under surfaces of lvs. only rarely glandular though usually pubescent, the canes generally very thorny: lvs. often smaller and stiffer, the lfts. short-pointed, the petioles and midribs conspicuously thorny: fl.-clusters short and leafy: fr. globular or short-oblong, black, usually good. Mostly in open places, from New Brunswick to Lake Superior and south to the Gulf.—Our most cosmopolitan Blackberry, and presenting innumerable forms. The plants described by Link and Bigelow had rather few and straightish spines, but some forms bear very strong hooked spines, and between these two forms there are all gradations. The species is much in need of critical study. In cultivation it is represented in Early Harvest and a few other varieties.

26. **flóridus,** Tratt. (*R. argùtus,* var. *flóridus,* Bailey). Canes armed with hooked prickles: pedicels and calyx pubescent, sometimes glandular: floral lvs. small mostly wedge-obovate and obtuse: fl.-cluster small with short (often very short) slender pedicels: fl.-buds small and globular, white-pubescent (particularly on the edges of the sepals): fls. large, with broad mostly overlapping petals. Evol. Native Fruits, Fig. 91.—What the writer takes to be this species seems to be common in southern Mississippi, and perhaps also in Alabama. How distinct it may be is only to be determined by careful studies in the field; but in its typical forms it is readily separated from *R. argutus.* It seems to be less erect (often climbing?) than *R. argutus.*

27. **Rándii** (*R. argùtus,* var. *Rándii,* Bailey). Fig. 2209. Low and wide-spreading (usually less than 3 ft.), sometimes becoming procumbent, with few or almost no prickles, the canes often almost herbaceous: lvs. very thin, usually becoming nearly or quite glabrous beneath, the teeth coarse, sharp and unequal, the lfts. on the young canes acuminate: fl.-cluster small and simple, commonly with a large simple leaf at the base, the pedicels long and slender and only slightly (if at all) pubescent: fr. small, usually rather dry, but sometimes juicy and good. Shady places, as in woods and thickets, New Brunswick to Lake Superior; to be looked for in the mountains of Carolina.—It impresses one as a weak woods form, sometimes seeming nearest *R. Canadensis* but oftenest suggesting *R. nigrobaccus;* but it seems to hold its characters better than most Blackberries.



2202. Cultivated form of Rubus occidentalis.—The Gregg Raspberry (× ½). No. 18.

Section 5. *Sand Blackberries, with stiff, erect, low and very thorny growths, small fl.-clusters, and lvs. white-tomentose beneath.*

2204. Rubus nigrobaccus (X ⅓). No. 22.

28. **cuneifòlius**, Pursh (*R. acutissimus*, Reasoner). Sand Blackberry. Fig. 239, Vol. I. Plant stiff and thorny, usually not over 3–4 ft. tall, the prickles many, hooked, and very strong, the young growths white-tomentose: lfts. on bearing canes mostly small and thick, wedge-oblong to wedge-obovate, obtuse or nearly so, densely white-tomentose beneath, the margins sharp-toothed; lfts. on the sterile canes larger, often ovate-pointed or elliptic: fl.-clusters 4–10-fld., short, more or less leafy and thorny, the fl.-buds globular and pubescent: fr. medium in size, firm, often sweet and good. Dry fields, Connecticut to the Gulf, and the common Blackberry in many places.—In cultivation this seems to be represented by the viciously thorny Topsy or Tree Blackberry, although the characteristic white tomentum largely disappears under domestication. Were it not for this tomentum, the species would be difficult to distinguish from *R. floridus*.

2205. Rubus nigrobaccus (X ⅓).

Section 6. *Swamp Blackberries, with weak hispid canes and reddish fruits.*

29. **setòsus**, Bigel. (*R. hispidus*, var. *suberéctus*, Peck). Mostly erect, sometimes ascending 2–3 ft., the slender canes clothed with many weak mostly recurved prickles and sometimes conspicuously hispid also, the prickles generally extending to the petioles and inflorescence: lfts. oblanceolate to ovate, pointed or acuminate, very strong-toothed: fr. small, with few drupelets, reddish black. Swamps, Quebec to Pa.—Not known to be in the trade, but inserted here because it is confused with *R. hispidus* and other species.

AA. *Dewberries: Plant trailing or decumbent.*

Group 1. Swamp Dewberries, with weak bristly stems, obovate shining lfts., and small red fruit.

30. **hispidus**, Linn. (*R. obovàlis*, Michx. *R. sempérvirens*, Bigel.). Fig. 2210. Stems very slender, scarcely woody but usually persisting over winter, creeping, bearing many weak reflexed small bristles: lfts. usually 3, thick, shining above, wedge-obovate or oval-obovate, usually obtuse, doubly serrate: fls. small, white, on few-flowered herbaceous nearly or quite leafless peduncles arising from the creeping canes: fr. small and of few drupelets, red to red-black, sour. Swamps or low sandy soils, Nova Scotia to Ga. and Kans.—Of no value for the fruit, but sometimes offered by dealers as a subject for covering the ground in moist places. The leaves usually persist through the winter, and in sunny places they assume a fine bronzy hue.

Group 2. Soft-caned Dewberries, with the stems thin and little woody or even almost herbaceous and the peduncles 1–2-fld.

31. **Énslenii**, Tratt. (*R. villòsus*, var. *humifùsus*, Torr. & Gray. *R. Baileyànus*, Britt.). Plant weak, with slender canes lying on the ground, the prickles small and relatively few or even none, the flowering canes sometimes almost herbaceous although having survived the winter: lfts. small and thin, oval-pointed to nearly ovate, irregularly and sharply serrate, nearly glabrous (or hairy on the margins and the veins): fls. of good, size, white, solitary (sometimes in 2's) on short, leafy peduncles: fr. small and nearly globular, loose, black, often good. Sandy places, New York and Mich. to Miss. Evol. Native Fruits, Figs. 77 and 87.—Has been confounded with *R. villosus*, but, as Rubuses go, it seems to be well distinguished. Probably not in cultivation.

Group 3. The common Northern Dewberries, with strong, prickly, often half-ascending canes and 2–several-fld. peduncles.

32. **villòsus**, Ait. (*R. Canadénsis*, Authors, not Linn.). Figs. 2211,2212. Canes strong, often several feet long and usually armed with strong recurved prickles, not standing alone when full grown but often rising 2 feet from the ground, the shoots mostly glabrous or becoming so: lvs. of medium size or becoming very large on strong plants, firm and thick, the 3–7 leaflets oval or ovate pointed or acuminate and sharply double-toothed: fls. white, few to several on the ends of short, leafy shoots of the season: fr. usually globose or short-oblong, shining black, the drupelets usually large. Fields and roadsides, Ontario (and Newfoundland?) to Fla. and Arizona.—The common Dewberry of the North, occurring in many forms in old fields, and often a troublesome pest. There are varieties cult. for the fruit. This is the plant named *Rubus villosus* by Aiton in 1789, although it has been supposed that he had the High-bush Blackberry (*R. nigrobaccus*). When

2206. Rubus nigrobaccus, a wild High-bush Blackberry (X ⅓). No. 22.

it was determined, in 1898, that Aiton had the Dewberry, rather than the Blackberry, when he made the name *R. villosus*, it became necessary to revise our nomenclature. It was supposed until that time, also, that Linnæus meant to designate the Dewberry by his *R. Canadensis*, but he really had the Thornless Blackberry.

Var. **Michiganénsis**, Card. A strong-growing form with mostly fewer prickles, very large, irregularly dentate-cut lfts. and pubescent fl.-clusters. S. W. Mich., and probably elsewhere. Not known to be in cult.

Var. **roribáccus**, Bailey. LUCRETIA DEWBERRY. Figs. 697, 698, Vol. I. Very robust form, with large, wedge-obovate, deep-cut lfts., very long pedicels, very large fls. (sometimes 2 in. across) and leafy-tipped calyx-lobes: fr. large. West Virginia, and in cultivation as the Lucretia Dewberry, which is the most popular current variety.

33. **invisus**, Bailey (*R. Canadénsis*, var. *invisus*, Bailey). Figs. 2213, 2214. Canes strong, terete, somewhat ascending, not very prickly (the prickles straightish): lfts. large and rather thin, light green, those on the verdurous shoots coarsely and simply toothed and the teeth usually abruptly pointed: fl.-cluster forking, with 2–6 long, slender, usually hispid pedicels: fls. large, with leaf-like sepals. Not uncommon from New York to Kansas and the Gulf.—In cultivation as Bartel and other Dewberries. When once understood, this species is generally easy to recognize. The best single diagnostic character is the large simple toothing of the leaflets on the sterile shoots.

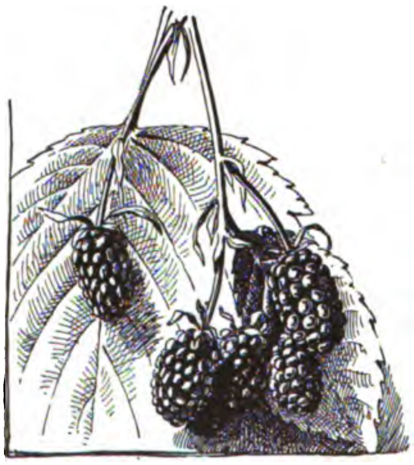
2209. Rubus Randii (×¾).

2210. Swamp Dewberry—Rul hispidus (× ½). No. 30.

2208. Rubus argutus — The Early Harvest Blackberry. No. 25.

Group 4. The Southern Dewberries, with very long, prickly and often hispid canes, narrow persistent lfts., and mostly 1-fld. peduncles.

34. **triviàlis**, Michx. SOUTHERN DEWBERRY. Fig. 2215. A most variable and perplexing species, the difficulties being increased by the fact that the same plant may bear three kinds of leaves: the large, broad Blackberry-like lvs. on the young verdurous sterile shoots; the smaller lvs. on the canes that are to bear fruit and which often persist over winter and remain at flowering time; the small lvs. that appear with or somewhat before the flowers. It is seldom that the leaves of sterile and flowering shoots of the same plant are preserved herbaria. Canes very long, usually wholly prostr (sometimes 10–15 ft.), thickly armed with prickles a sometimes bearing reddish bristl lfts. usually 3, narrow-ovate to long, short-pointed, rather shallov and sometimes bluntly toothed, petiole and midribs usually prick fls. of medium si mostly on simp more or less pric peduncles: fr. u ally oblong, sor time's excellent oftener dry a seedy. From Virgi to Florida and Tex and in cult. in two three forms for fruit.—This is common Dewberry the southern stat It is often a seri pest in old fiel Some of the forms very distinct, but it seems to be impossible to disco characters by means of which they can be distinguis with even a fair degree of uniformity. Some of th forms have fls. 2 in. across. Fig. 2215 is a drawing of of the specimens (there are two similar specimens the sheet) on which Michaux founded *R. trivialis*. tanically, this species is probably the most perpl ing of American Rubi. Some of the kinds in the treme South are remarkably robust. Forms have b found with canes 40–50 ft. long and nearly an inch diameter.



2207. Cultivated form of Rubus nigrobaccus, var. sativus. (× ½.) No. 22.

Group 5. The Western Dewberries, with pubesc lvs., and fls. often imperfect.

35. **vitifòlius**, Cham. & Schlecht. (*R. ursin* Cham. & Schlecht. *R. macropétalus*, Dougl.). PACI COAST DEWBERRY. Widely trailing, with slender, m or less pubescent canes which are provided with l but weak, straight or slightly recurved prickles: various, usually thicker and more woolly upon staminate plants, composed of three ovate, doubly nate-toothed leaflets, or sometimes only 3-lobed, long petiole and usually the midribs prickly: fls. fect, staminate or pistillate on different plants, borne shoots 6–12 in. high, which bear 1- to 2-flowered pric or hispid and generally pubescent peduncles, the pe of the staminate forms large and showy, those of pistillate forms usually small, the calyx-lobes eit short and entire or somewhat prolonged and indistin toothed: fr. of fair size, blackish, mostly round-oblo

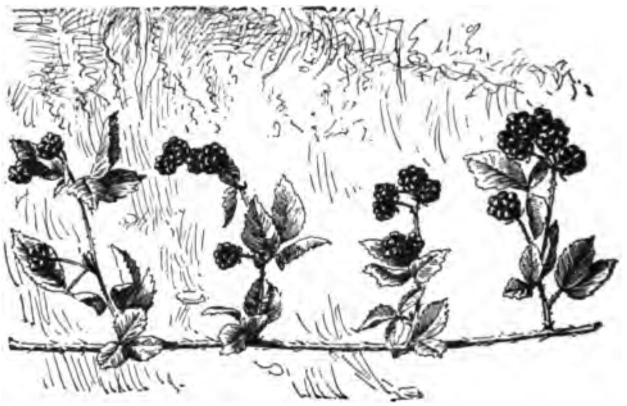
sweet. In the mountains, particularly in the Coast Ranges, of the Pacific slope; also in Idaho.—It has come into some prominence as a fruit plant within the last dozen years. Named varieties are Aughinbaugh, Skagit Chief, Belle of Washington and Washington Climbing Blackberry. The species is perplexingly variable, and well-marked characters seem to be associated with the different sexual forms. The Loganberry (which see, p. 937) is said to be a hybrid between this species and *R. Idæus*. *R. vitifolius* is recorded as having been crossed with *R. cratægifolius* by Luther Burbank. The Mammoth Blackberry of California is said to be a cross between *R. vitifolius* and the Wild Blackberry of Texas (*R. argutus ?*). See Pacific Rural Press, Sept. 4, 1897, for description and portrait. The account says that the Mammoth "produces berries of immense size, supposed to be the largest Blackberry ever grown, berries 2¾ inches in length being frequently found. * * * The canes of the Mammoth are very peculiar, being very large and thickly covered with small, short spines. The canes start early in March, grow thick and stout until about 5 ft. high; they then take on a running habit and grow from 25 to 30 ft. in a season. Late in the fall the tips or stolons seek the ground and take root." The variety is partially evergreen in California. The fruit is said to be more acid than the old Lawton Blackberry, but "when perfectly ripe is sweet and of superior flavor."

Group 6. Exotic Dewberries, with very long, prickly, glaucous canes and large very sharp-toothed lfts.

36. **dumetòrum**, Weihe. Fig. 2216. Canes long and slender, terete, often 10–25 ft. long, trailing or half-prostrate, glaucous, thickly beset with rather small somewhat curved spines: lfts. usually 3, mostly broad-ovate, pointed to acuminate, irregularly sharp-toothed, becoming bronzy and brown in autumn: fls. small, white, the calyx white-tomentose, on short pedicels in a cluster terminating leafy growths of the season: fr. of a few large black drupelets. Europe.—Lately introduced for the covering of banks and stony places, for which it is highly recommended. Its autumn color is attractive. Hardy in New England.

R. biflòrus, Ham. Raspberry, apparently allied to R. occidentalis, and prized in cult. for its glaucous-white canes: reaches 8–10 ft., with strong arching canes that bear strong, recurved prickles: lfts. ovate or oval, incise-serrate, whitish beneath: fls. large and white, 1–3 on drooping pedicels: berry amber-colored, size of the common Raspberry, the calyx at first erect but finally spreading. Temperate Himalaya. B.M. 4678. R.H. 1855:5. Gn. 54, p. 456.—*R. Capénsis*, Burbank. Under this name Luther Burbank describes a bramble that came to him "by way of New Zealand from South Africa, and is probably the one that Stanley speaks so highly of as growing in places on the Dark Continent. The canes grow to a height of 6–10 feet, bending over and rooting from tips like Blackcap Raspberries. The whole plant is covered with a short, rusty down, and few short scattered prickles; the fruit is fully as large or larger than Shaffer's Colossal Raspberry, of a purplish wine or mulberry color, and of excellent quality, though the berries do not separate from the receptacle as freely as they should; it is a very promising berry-plant." See Burbank's "New Creations in Fruits and Flowers," June, 1894; also Gn. 48, p. 126. The picture represents a very rugose leaf with 5 shallow nearly rounded lobes and very irregularly serrate margins: stems with curved prickles, and a small cluster with large, globular short-pedicelled fruits. It is probably R. Moluccanus. —*R. Japónicus*, Veitch. Known to horticulturists in its variegated form (R. Japonicus tricolor): slender trailer, with rose-colored stems and petioles: lvs. ovate, mostly indistinctly 3-lobed, very sharply toothed, the youngest ones pinkish white and the mature ones blotched green and white. Not known to be in cult. in this country. It would probably not be hardy north. The botanical position of the plant is not designated. G.C. III. 16:95. J.H. III. 29:60. G.M. 37:442.—*R. Moluccànus*, Linn. A large Raspberry, common in India and Malaya, and to be expected as an introduced plant in many warm countries. Very robust, the canes and branches red-hairy and spiny: lvs. very variable, large, usually hairy, dull-pubescent beneath, shallowly 3–5-lobed, irregularly serrate: fls. white, in contracted terminal clusters: fr. in shades of red, succulent. B.R. 6:461.—*R. stellàtus*, Smith, produces an edible fruit, prized in Alaska: stem simple and herbaceous, only a few inches long, 1-fld.: lvs. cordate, 3-lobed or 3-parted: fls. red. Northwestern Arctic America.

L. H. B.



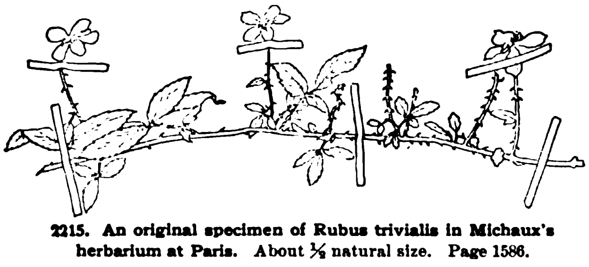
2211. Small form of Rubus villosus, the northern Dewberry. Generally known as *R. Canadensis*. No. 32.

2212. Rubus villosus, the northern Dewberry. (× ½.) No. 32.

RUDBÉCKIA (after the two Professors Rudbeck, father and son, predecessors of Linnæus at Upsala). *Compósitæ.* CONE-FLOWER. As defined by Gray (Syn. Flora N. Amer., 1886), Rudbeckia is a genus of 21 species of North American herbs, many of which are hardy and perennial, bearing in summer showy fls. which usually have yellow rays, though in one species (*R. atrorubens*) the rays are all dark crimson, and in the other species the rays are occasionally more or less covered with purple-brown towards the base. Under Rudbeckia are often included in nursery catalogues certain plants which Gray refers to Echinacea and Lepachys. These three genera form an interesting floricultural group. Rudbeckia and Lepachys are typically yellow-fld. genera, while Echinacea contains a few forms with fls. ranging from flesh color and rose-purple to crimson. The chaff of the receptacle is usually persistent in Rudbeckia and deciduous in Lepachys.

2213. Rubus invisus, the cultivated form known as Bartel Dewberry.
See *Rubus*, page 1586.

Among the hardy herbaceous species, there are several with striking habit and distinct foliage. There is a wide range of color among wild plants of the same species, and specimens with the brown-purple color at the base should be sought for. The rays may be few or many, short and broad or long and narrow, toothed in various ways, star-like or making a continuous limb, drooping or horizontal, and always set off by the disk, which may be purple, black or yellowish, high and columnar or low and roundish. The season of bloom could be extended. The flowers of many of the kinds are excellent for cutting.


2215. An original specimen of Rubus trivialis in Michaux's herbarium at Paris. About ½ natural size. Page 1586.

The only full double form, apparently, is Rudbeckia Golden Glow, which has had great popularity since 1896. The origin of this great favorite seems to be unknown. About 1894 John Lewis Childs found it among some plants sent by correspondents. See Gng. 6:370. For the structure of the Rudbeckia inflorescence, see Fig. 829, Vol. II.

W. M.

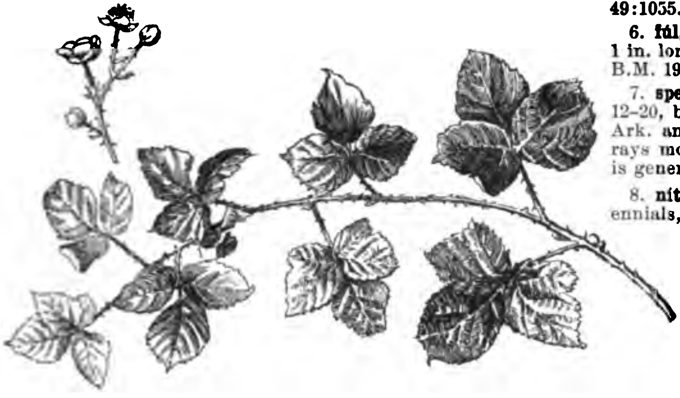
The Cone-flowers are of easy cultivation in almost any soil and situation, from a semi-shady position to one in full sun. Most of the species are found inhabiting moist locations, but thrive well in the garden under the ordinary methods of cultivation, although *R. laciniata* and its double form, Golden Glow, do much better if abundantly supplied with moisture. *R. hirta*, our Black-eyed Susan,—sometimes called by the children out west "Nigger-heads,"—will thrive in the driest, hottest situation, where many others would fail.

The best known as a garden plant, and probably the showiest, is Golden Glow, which the undersigned considers the best perennial of recent introduction. If cut back severely when through blooming and well watered, it often produces a second crop of flowers. Autumn Glory will be well liked when better known. It is fine for massing and has a much longer blooming period than Golden Glow, commencing earlier and continuing until frost. It resembles *R. nitida*, but is taller and blooms longer.

2214. Leaf of Rubus invisus, showing the simple teeth (× ⅔).
See *Rubus*, page 1586.

R. triloba is one of the very best, and, while a biennial, perpetuates itself through self-sown plants. It forms a dense twiggy bush somewhat over three feet high and nearly as broad if kept moderately well watered, and much smaller if in a dry situation. These plants may be used with effect as a border to a large bed of hybrid delphiniums, as the latter will tower above them and bloom in their young state. By the time the delphiniums are cut down for their second flowering the Rudbeckias hide their untidiness and are in their prime, but later on may be pulled up to again expose the delphiniums. An effective fall-flowering group may be formed by using the lighter-colored flower forms of *Hibiscus Syriacus*—such as Totus albus, Lady Stanley, and Elegantissima—for a center or background, and interspersing groups of the taller Rudbeckias (except Golden Glow, which is too tall and spreading) and boltonias next to them. In front of these place *R. speciosa* and *R. triloba*, with the blue form of *Aconitum Napellus*, and for a border use *R. bicolor*, var. *superba*, placed well to the front to be pulled up when its bloom is past. This group will give color from July until frost. The allied plant *Echinacea purpurea* and *E. angustifolia* are well adapted for grouping in open bays in shrubby borders, as their flowers are extremely durable and seem in harmony with such surroundings. Rudbeckias are easily increased by seeds, cuttings or division.

W. C. EGAN.



2216. Rubus dumetorum, an Old World Dewberry (X ⅓). Page 1587.

A. *Base of upper lvs. cordate-clasping*............................ 1. **amplexicaulis**
AA. *Base of upper lvs. not cordate-clasping.*
  B. *Color of disk brown or dark purple: shape of disk never cylindrical.*
    C. *Lower lvs. deeply 3-cut.*
      D. *Duration biennial: disk black-purple*............ 2. **triloba**
      DD. *Duration perennial: disk dull brownish* .... 3. **subtomentosa**
    CC. *Lower lvs. not deeply 3-cut.*
      D. *Plants bristly-hairy.*
        E. *Rays ½–¾ in. long* .... 4. **bicolor**
        EE. *Rays 1–2 in. long* ...... 5. **hirta**
      DD. *Plants nearly glabrous.*
        E. *Lvs. mostly entire*...... 6. **fulgida**
        EE. *Lvs. irregularly serrate.* 7. **speciosa**
  BB. *Color of disk greenish or yellowish.*
    C. *Lvs. entire or barely dentate.*
      D. *Height 2–4 ft.: lvs. bright green*.................... 8. **nitida**
      DD. *Height 4–9 ft.: lvs. glaucous*.................... 9. **maxima**
    CC. *Lvs. (upper stem-lvs.) 3-cleft*. 10. **laciniata**

INDEX.

amplexicaulis, 1.
bicolor, 4.
fulgida, 6.
Golden Glow, 10.
hirta, 5.
laciniata, 10.
maxima, 9.
Newmani, 7.
nitida, 8.
speciosa, 7.
superba, 4.
subtomentosa, 3.
triloba, 2.

1. **amplexicaúlis**, Vahl. Annual, 1–2 ft. high: rays ½ in. long or more, yellow, often with a brown-purple base; disk brownish, finally somewhat cylindrical. Low grounds, La. and Texas. B.B. 3:418.

2. **tríloba**, Linn. Fig. 2217. Biennial, 2–5 ft. high, bright green: lvs. thin: rays 8–10, deep yellow, base sometimes orange or brown-purple: chaff awned. Moist soil, N. J. to Mich., south Ga. to La. and Mo. B.B. 3:415. B.R. 7:525.—Blooms the first year from seed.

3. **subtomentòsa**, Pursh. Perennial, 2–5 ft. high, ashy gray: lvs. thick: rays 15–20, yellow, sometimes with a darker base: chaff blunt. Prairies, Ill. to Tex. B.B. 3:415.

4. **bícolor**, Nutt. Annual, 1–2 ft. high: lvs. 1–2 in. long: rays yellow, with a blackish purple base or all yellow. Pine woods or sandy soil, Ark., Tex., and east to Ga.—Var. **supérba**, Hort. Haage & Schmidt, has heads 2 in. across: rays yellow above, purplish brown below. Gt. 47, p. 220. S H. 2, p. 169.

5. **hírta**, Linn. BLACK-EYED SUSAN. YELLOW DAISY. Biennial or annual, 1–3 ft. high: lvs. 2–5 in. long: rays golden yellow, sometimes orange at base. Dry and open ground; common over wide range. B.B. 3:416. Gn. 49:1055.

6. **fúlgida**, Ait. Perennial, 1–2 ft. high: rays 12–14, 1 in. long. Dry soil, Pa. to Mo., south to La. and Tex. B.M. 1996. Mn. 6:221.

7. **speciòsa**, Wenderoth. Perennial, 1–3 ft. high: rays 12–20, becoming 1½ in. long. Moist soil, Pa. to Mich., Ark. and Ala. G.C. II. 16:372 (heads 3–4 in. across, rays more than 30, in 2 series).—*R. Néwmani*, Loud., is generally considered a synonym of this species.

8. **nítida**, Nutt. This and the next are southern perennials, with lvs. entire or barely dentate: rays drooping, pure yellow, several or numerous; disk finally columnar, 1–2 in. long. Wet ground, Ga. to Fla. and Tex. Gn. 47:1006.

9. **máxima**, Nutt. Closely allied to *R. nitida* and differing as indicated in the key. Moist pine woods and plains, Ark., La., Tex. Gn. 47:1018.

10. **laciniàta**, Linn. Perennial, 2–7 ft. high: lower stem-lvs. 3–5-parted, upper ones 3-cleft: rays yellow, few or several, soon drooping; disk cylindric in fruit. Moist ground, Canada to Fla., west to Mont. and New Mex. G.F. 2:281. **Golden Glow** is a full double form. Fig. 2218. Gng. 5:5, 117; 6:370. A.F. 12:274, 275. Gn. 50, p. 411. G.C. III. 20:339.

R. angustifòlia, Linn., is Helianthus angustifolius.—*R. pinnàta*, Vent., is Lepachys pinnata.—*R. purpùrea*, Linn., is Echinacea purpurea.

W. M.

RUE. See *Ruta graveolens.*

RUE ANEMONE. See *Syndesmon.*

RUE, GOAT'S. *Galega officinalis.*

RUÉLLIA (after Jean de la Ruelle, a French botanist). *Acanthàceæ.* A genus of about 150 species of herbs or shrubs, mostly American, pubescent, villous or rarely glabrous: lvs. opposite, mostly entire: fls. violet, lilac, white, red or rarely yellow. The fls. are sessile or nearly so in axils of lvs. or bracts; they are solitary, fascicled, or in spreading, paniculate cymes. Bracts herbaceous, loose or imbricated, usually small and narrow, rarely oblong or lanceolate. Corolla-limb 5-lobed, equal, or with the upper lobes connate at the base; stamens 4: capsule oblong or club-shaped, terete or compressed, 6–20-seeded: seeds compressed.

A. *Blossoms sessile or nearly so.*
  B. *Lvs. green.*
C. *Fls. blue, 1½–2 in. long.*

cilliòsa, Pursh. A hardy perennial herb, about 1½ ft. high, erect or prostrate, hirsute or pubescent: lvs. hairy, ciliate, usually oblong, sessile or short-petioled, 1½–3 in. long: fls. solitary or clustered, axillary, blue, 1½–2 in. long. Aug., Sept. In dry, light soil, N. J., south and west. B.B. 3:203.—Prop. by seeds or division.

CC. *Fls. rosy, 2–6 in. long.*

macrántha, Mart. It forms a compact, many-stemmed

2217. Rudbeckia triloba (X ¼).

shrub, 1-6 ft. high, with ovate-lanceolate lvs. 4-6 in. long: fls. large, bell-shaped, with tubular base, purplish rose with purple veins, solitary in leaf-axils. Brazil. G.C. III. 17:45. R.H. 1881:410.—G. W. Oliver says in his "Plant Culture" that *R. macrantha* is of easy cultivation and is one of the best greenhouse flowering plants for amateurs. Cuttings rooted in September furnish fair-sized flowering plants in January. These, if desired, may be planted out in late spring, when they will have formed large specimens, which may be lifted and potted.

2218. Rudbeckia laciniata, var. Golden Glow (× ⅙). See p. 1589.

BB. *Lvs. marked with white.*

C. *Fls. white, often veined with lilac.*

Devosiàna, Hort. A low-growing tender Brazilian species, with lanceolate lvs. marked on the upper surface with white along the nerves and having the lower surface entirely purple: fls. rather small, usually white, with blue stripe, axillary; corolla-tube suddenly dilated and bent at the middle.

CC. *Fls. carmine or rose.*

Makoyàna, Hort. A compact, bushy plant resembling *R. Devosiana*, Hort., in foliage, but differing in the color of the fls. (bright carmine) and by their somewhat larger size. Brazil. R.B. 21:109. R.H. 1896:576.—Prefers shade. It is said that the color of the foliage is better when soot is mixed with the soil.

AA. *Blossoms on long peduncles.*

B. *Fls. blue or purple.*

tuberòsa, Linn. A perennial herb, 2-3 ft. high, with oval or ovate lvs. 2-3 in. long and blue fls. 1½-2 in. long, in terminal, nearly naked panicles; stigma single: capsule 12-16-seeded. Southwestern U. S.; cult. in Fla.

BB. *Fls. red.*

C. *Peduncles much branched.*

amœ̀na, Nees (*Stephanophỳsum longifòlium*, Pohl). A half-hardy perennial, about 1½ ft. high: lvs. oblong-lanceolate or oblong, narrowed at both ends; margins repand-denticulate or simply repand: fls. bright red, in axillary sprays in summer. Brazil. F.M. 1880:419.

CC. *Peduncles but little branched.*

formòsa, Andr. Fig. 2219. A low-growing, tender, herbaceous perennial: lvs. ovate, rounded at the base, hairy on both sides: fls. on straight, axillary peduncles; corolla scarlet, showy, 1½ in. long, the upper 2 lobes joined for half their length. Summer. Brazil. B.M. 1400.—Cult. in California.

R. vàrians, Vent. See Dædalacanthus nervosus.

F. W. BARCLAY.

RULÍNGIA (after J. Ph. Ruling, a botanist of Göttingen). *Sterculiàceæ.* This includes two plants cult. in S. Calif. *R. parviflora* is highly recommended as a rock plant by Ernest Braunton, of Los Angeles, who grows it in quantity for its trailing habit and myriads of small pink fls. borne in spring. Franceschi says that *R. pannosa* is odd and pretty by reason of the fleecy coating of the leaves. A genus of about 15 species of shrubs or undershrubs from Australia, except one a native of Madagascar. Lvs. various in size, entire, toothed or lobed: fls. mostly white, small, in cymes; calyx 5-lobed; petals 5, broad and concave or convolute at the base, with a small, broad or linear ligula at the top; stamens shortly or scarcely joined at the base, 5 without anthers, petal-like, 5 perfect, short: ovary sessile, 5-celled; ovules 1-3 in each cell. Flora Australiensis 1:237.

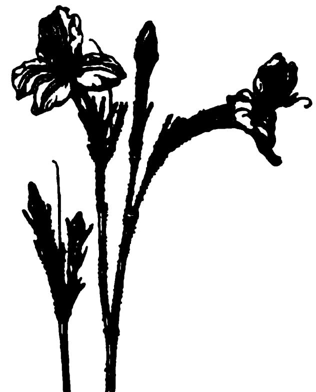
A. *Lvs. 1-3 in. long.*

pannòsa, R. Br. Eventually a shrub, several ft. high, but flowering freely at a young age: lvs. scabrous-pubescent above, densely velvety hirsute below, on older plants ovate-lanceolate to lanceolate, on young plants broader and often 3-4-lobed: cymes shortly pedunculate: fls. white. B.M. 2191.—The plant offered in Calif. as *Pomaderris apetala* is said to belong here.

AA. *Lvs. usually less than 1 in. long.*

parviflòra, Endl. A low shrub, with branches ½-1½ ft. long, ascending or prostrate: lvs. ovate or ovate-lanceolate, obtuse, deeply crenate, mostly lobed: fls. pinkish, in shortly pedunculate cymes. F. W. BARCLAY.

RÙMEX (the Latin name). *Polygonàceæ.* DOCK. SORREL. Herbs, mostly perennial, with strong roots, of more than 100 species in many parts of the world. Most of the species are weedy plants, but some of them afford leaves for "greens" and others are useful for ornament. All are of the easiest culture. Prop. mostly by seeds.


2219. Ruellia formosa (× ½).

As a genus, Rumex is closely allied to Fagopyrum, the buckwheats, Rheum, the rhubarbs, and Polygonum, the jointweeds. They are mostly leafy-stemmed plants, with small flowers in panicles, the pedicels mostly in whorls and jointed: fls. perfect or imperfect, with 6-parted calyx, the 3 inner lobes larger and generally one or all of them bearing a grain or tubercle near the center; stamens 6; stigmas 3: fr. a 3-sided often margined or winged akene. In the larger species the stems are grooved and hollow. Most of them are erect-growing plants. See *Dock* and *Sorrel*.

A. *Docks: lvs. not hastate: fls. perfect, or at least not diœcious.*

B. *Wings of calyx not tubercle-bearing.*

venòsus, Pursh. Perennial, 1½ ft. or less tall, glabrous, branched: lvs. oblong-ovate or ovate-lanceolate, usually tapering at both ends, entire, the stipular sheaths (ocreæ) funnelform and prominent: wings of fr. large and thin, entire, 1 in. or more across, red-veined and showy, the pedicels hanging in fruit. Mo., west.—Recently offered as an ornamental plant, because of the very showy wide-winged fruiting calices.

hymenosèpalus, Torr. (*R. Sáxei*, Kellogg). CANAIGRE. RAIZ COLORADA. Erect, reaching 3 ft., glabrous, the root of clustered fusiform tubers: lvs. oblong-lanceolate, sometimes 1 ft. long, narrow at either end, short-petioled, entire, gray-green, somewhat mottled beneath: fls. perfect, large, in crowded panicles, green: fruiting calyx-lobes ⅜ in. across, brown, entire, veiny, the pedicels drooping. Indian Terr. and Tex. to Calif. B.M. 7433.—"Leaf-stalks used as rhubarb, for which reason it is known also as pie-plant in California." *Franceschi*. The plant has some ornamental value, but is of great economic importance as a tannin-producing plant. The tannin is secured from the dahlia-like roots. For literature on the economic uses of the plant, consult reports of experiment stations in Ariz., Calif., and elsewhere.

occidentàlis, Wats. Stout perennial, reaching 3 ft., glabrous: lvs. lanceolate to ovate-lanceolate, more or less wavy-margined, obtuse or nearly so, the base subcordate, long-stalked: wings of the fr. subtriangular, somewhat toothed, veiny, brown, ½ in. across. Labrador across the continent, descending along the Rocky Mts. and reaching Texas.—Once introduced as an ornamental subject, because of its profuse and somewhat showy fruiting calices.

BB. *Wings of calyx bearing one or more tubercles.*

Patiéntia, Linn. HERB PATIENCE. SPINAGE DOCK. Tall, strong, erect, nearly simple plant, reaching 5 ft. when in flower, glabrous: root-lvs. (Fig. 728, Vol. I) elliptic-ovate, tapering both ways, the margins undulate, the blade 8–12 in. long; stem-lvs. ovate-lanceolate, long-acuminate, more or less rounded at the base: inflorescence long and compound (often 2 ft. long), dense in fr.: wings cordate, about ¼ in. across, veiny, entire, one of them bearing a small tubercle near the base. Europe, but naturalized in many places.—An excellent plant for greens, the strong root-lvs. being used in early spring. Perennial.

crispus, Linn. CURLY DOCK. Tall, often 3–3½ ft.: lvs. long-lanceolate, wavy-margined, rounded at the base: wings entire, the tubercles usually 3, the inflorescence not leafy. Naturalized from Europe, and now one of the common Docks about yards and in old fields.—Not cult., but the lvs. sometimes used for greens.

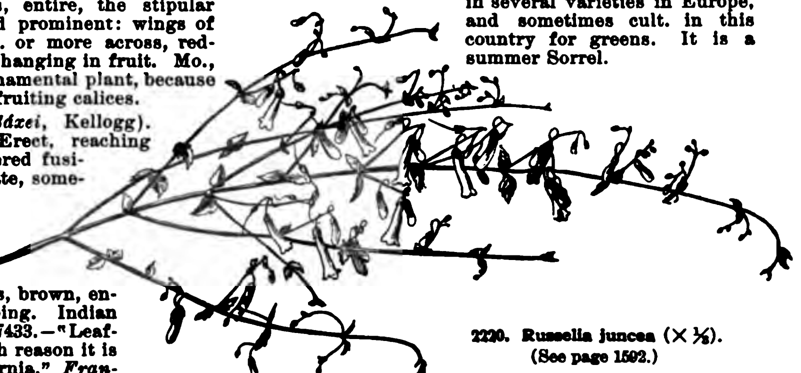
obtusifòlius, Linn. BITTER DOCK. Also a common weed: lvs. much broader, very obtuse or even cordate at base, obtuse at apex, not wavy-margined: wings long-toothed, the tubercle usually 1, the inflorescence somewhat leafy below. Eu.

AA. *Sorrels: lvs. mostly (at least the radical ones) hastate or sagittate: fls. imperfect, the plants sometimes diœcious.*

B. *Plant perennial (R. Acetosella sometimes annual).*

Acetòsa, Linn. GARDEN SORREL. Stem strong and erect (3 ft. or more tall in fr.), furrowed, the plant glabrous: root-lvs. thin and light green, oblong and obtuse, with sharp auricles at the base (Fig. 729, Vol. I), the petioles slender; stem-lvs. relatively narrow, acuminate: inflorescence large and ample, the larger part of the fls. sterile (plant sometimes diœcious): wings entire or very nearly so, not over ⅛ in. across, cordate-ovate, each with a callosity near the base, the outer small scales reflexed. Eu. and Asia, and naturalized in some places in this country.—Useful for early spring greens, but later in foliage than *R. Patientia*.

scutàtus, Linn. FRENCH SORREL. Lower, with many branching prostrate or ascending stems, glaucous: lvs. somewhat fleshy, the radical ones long-stalked and cordate-ovate-obtuse, the stem-lvs. short-stalked and hastate-fiddleform and acute or sometimes 3-lobed: wings thin, cordate, without callosities. Eu., Asia.—Grown in several varieties in Europe, and sometimes cult. in this country for greens. It is a summer Sorrel.



2220. Russelia juncea (× ⅓). (See page 1592.)

Acetosélla, Linn. COMMON FIELD OR SHEEP SORREL. Common in all old fields, where it indicates sterile soil: lvs. oblong, from a hastate-lobed base: fls. reddish, in erect racemes. Not cult., but the sour root-leaves are sometimes used for greens. Eu.

BB. *Plant annual.*

ròseus, Linn. One to 2 ft., with spreading and branched stems, glabrous and somewhat glaucous: lvs. small, deltoid-ovate, entire, short-pointed, truncate-cuneate or almost cordate at base: racemes short and leafless or nearly so, the pedicels drooping in fr.: wings cordate-orbicular, ½–¾ in. across, thin, rosy-veined, without callosities. Egypt to Persia.—Rarely cult. as an ornamental for its showy fruiting calices.

L. H. B.

RUPTURE-WORT. *Herniaria.*

RÚSCUS (an old Latin name). *Liliàceæ.* BUTCHER'S BROOM. A genus of possibly 3 species scattered over Europe. Erect shrubs, with minute bract-like lvs. and branches (phyllodia) simulating leathery, persistent, veined, sessile, leaf-like bodies: fls. small, springing from the midrib of the lower surface of the phyllodium.

aculeàtus, Linn. Shrub, 1½–3½ ft. high: phyllodia ovate-lanceolate, ½–1½ in. long, tapering into a spiny point: fls. 1–2, short-pedicelled: berry red, ½ in. thick. Spring. Gn. 34, p. 231. R.H. 1894, p. 545.—Cult. in Fla. and S. Calif.

According to A. Blanc, *R. Hypoglóssum*, Linn., has been highly commended lately in Germany as a decorative subject. This species and *R. Hypophyllum*, Linn., are both natives of southern Europe, where they have been studied by various botanists, some of whom distinguish them by various characters, while others unite them into a single species. J. G. Baker considers R. Hypoglossum a variety of R. Hypophyllum, differing in having the costa under the cluster of fls. in the form of a large leafy bract lacking entirely the texture of the phyllocladium. In B.M. 2049 R. Hypophyllum is shown with minute white fls. and handsome red berries nearly ½ in. thick.

F. W. BARCLAY.

RUSH. *Juncus.* **Flowering Rush** is *Butomus.* **Rush Lily.** See *Sisyrinchium.*

RUSSÈLIA (Alexander Russell, English physician and author of "Natural History of Aleppo," 1856). *Scrophulariàceæ.* About a dozen species of Mexican shrubby plants with angular, usually slender, often pendulous branches: lvs. usually small, becoming scale-like on the branches, opposite or verticillate: fls. bright red, in dense or loose corymbs or of a single flower; calyx 5-parted; corolla-tube cylindrical, the lobes spreading and nearly equal; staminodia very short or wanting; stamens 4: capsule subglobose, 2-celled: seeds numerous, very small, winged. A recent synopsis of Russelia by Dr. B. L. Robinson, with a key to the species, will be found in Proc. Am. Acad. Arts & Sci., vol. 35, No. 16, March, 1900.

Russelias are of easy cultivation. *R. juncea* and its varieties make excellent basket plants, being almost continuously in bloom. Propagated by cuttings.

A. *Peduncles 1–3-flowered.*

júncea, Zucc. (*R. scopària*, Hort.). CORAL PLANT. Fig. 2220. A tender shrubby plant, with smooth, somewhat rush-like branches, nodding or pendulous at the top: lvs. linear-lanceolate or ovate, small, becoming minute bracts on the branches: raceme very loose, remotely flowered: peduncles elongated. B.R. 21:1773. P.M. 4:79. —Vars. **Lemóinei** and **elegantíssima** are garden hybrids of *R. juncea* and *R. sarmentosa*. They are more floriferous, especially during the winter, than the type.

AA. *Peduncles many-flowered.*

sarmentòsa, Jacq. (*R. multiflòra*, Sims). A tender shrub, becoming 4–6 ft. high: lvs. opposite, ovate, acuminate, serrately crenate: fls. verticillate, many in a terminal raceme. B.M. 1528. P.M. 16:163. R.H. 1852:281.

F. W. BARCLAY.

RUSSIAN CACTUS. Same as Russian Thistle.

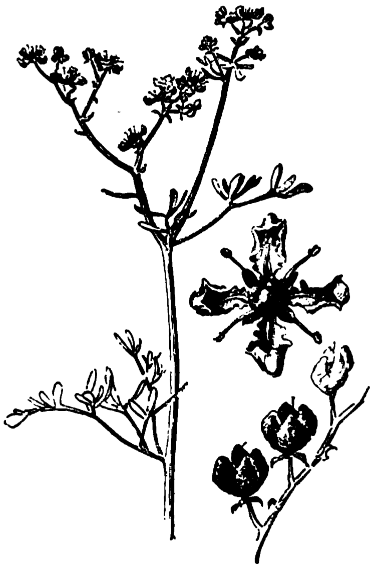
RUSSIAN FRUITS. See *Pomology*. **R. THISTLE.** See *Salsola*.

RUST. A name for a class of fungi which produce disease in plants. Rusts are of the class Uredineæ. The mycelium branches among the tissues of the host and produces several kinds of spores, either upon the one host (autœcious), or upon different hosts (heterœcious). These spores, as shown typically in the disease of the wheat, are called respectively uredospores, teleutospores, æcidiospores, etc. Recent researches by Eriksson and Henning in Sweden show that the three common rusts which affect the grains, namely: *Puccinia graminis* (Figs. 2221–2), *P. rubigo-vera* and *P. coronata*, can be split up into seven species, characterized by their cultural reactions with a large series of plants, and that *Puccinia graminis* has besides six specialized forms, delimited by differences in the marked capacity of the uredo- or teleutospores to inoculate on different hosts. Several rusts are common on cultivated plants, causing disease; viz., beet rust (*Uromyces Betæ*), broad bean rust (*Uromyces Fabæ*), white pine rust (*Cronartium ribicolum*), asparagus rust (*Puccinia Asparagi*), chrysanthemum rust (*Puccinia Hieracii*), black, or wheat rust (*Puccinia graminis*), hollyhock rust (*Puccinia malvacearum*), etc. JOHN W. HARSHBERGER.

2221. Colonies of Rust on the stem of wheat.

2222. The cluster-cup stage of the wheat Rust fungus growing on a barberry leaf.

The rusts are fungi constituting a very large and economically important class known as Uredineæ. They are all obligatory parasites, attacking a vast number of native and cultivated plants. The mycelium of the rust fungi exists entirely within the tissues of the host. The spores are formed in masses or sori just beneath the epidermis. When ripe they break through the epidermis, forming brown patches and spots from which they are scattered. Many of the rusts produce several spore-forms, which often occur in regular succession either on the same host or on different hosts. For example, the wheat rust produces uredospores and teleutospores on the wheat and æcidiospores on the barberry.


2223. Ruta graveolens. Flowers slightly enlarged.

Rusts rarely kill the plants which they affect, and hence in many cases the damage done is not as apparent as in many other diseases. In all cases, however, the plants are weakened, and often much disfigured. They are among the most difficult fungous diseases to combat. Spraying has been tried in many instances, but has proved, at most, only partially successful. The most profitable course for overcoming these diseases seems to be the selection of resistant varieties.

HEINRICH HASSELBRING.

RÙTA (classical name of rue). *Rutàceæ.* About 40 species from the Mediterranean region of Europe and from Asia. Perennial herbs, often woody at the base, glandular, punctate: lvs. simple to much pinnate, odorous: fls. yellow or greenish, in terminal corymbs or panicles, hermaphrodite, usually 4-merous; petals 4–5, free, often dentate or ciliate; stamens 8–10: ovary sessile: capsule 4–5-lobed, indehiscent or dehiscent at apex.

gravèolens, Linn. RUE. HERB OF GRACE. Fig. 2223. A hardy perennial, woody at the base, 1½–2 ft. high: lvs. fragrant, much divided; lobes oblong, the terminal obovate: fls. yellow. July. Prop. by division and seeds.

Patavina, Linn. (*Haplophýllum Patavìum*, Hort.). A hardy perennial herb 4–6 in. high: lvs. glabrous, the lower oblong-spatulate, narrowed at the base, the others trisected and laciniate: corymb dense; pedicels somewhat longer than the fls.: fls. golden yellow. June, July.

F. W. BARCLAY.

RUTABAGA, or SWEDISH TURNIP. Consult *Brassica campestris*, page 177; also *Turnip*.

RUTLAND BEAUTY is *Convolvulus Sepium*.

RYE. See *Secale*. **RYE, Wild.** See *Elymus*.

S

SABAL (possibly a native name in South America, but the author of the genus does not explain). *Palmàceæ.* Spineless palms, low, tall or almost stemless, the robust, ringed trunk obliquely ascending at the base, clothed above with dead leaf-sheaths: lvs. terminal, orbicular or cuneate at the base, flabellately multifid; segments linear, bifid, filamentous on the margins, induplicate in the bud; rachis short or long; ligule short, adnate to the rachis; petiole concave above, the margins smooth, acute; sheath short: spadices large, elongated, decompound, at first erect, the branches and branchlets slender, recurving, pendent; spathes sheathing the branches and peduncles tubular, oblique at the throat: bracts and bractlets minute: fls. small, glabrous, white or green: fruits small, globose, black, the short style basal. Species 6, Florida to Venezuela, and one in Sonora.

Some botanists make the species names all feminine; others neuter. JARED G. SMITH.

The Cabbage Palmetto (*Sabal Palmetto*) grows in groups of a few specimens to several hundreds or even thousands in the rich black soil on the banks of the St. Johns and Ocklawaha rivers of Florida, forming a glorious sight; and even the tourist who is blind to most of the charms of nature cannot help being overwhelmed by the beauty and grandeur of these palms. They are found northward to South Carolina, but they attain their fullest development in Florida, where they always form an important feature of the landscape. Generally they grow in dense groups, but they are more beautiful in all their parts where they have room enough to spread. In southern Florida the undersigned has often found underneath the crown of leaves a dense wreath of ferns (*Polypodium aureum*), which heightens the charm of these palms considerably. On the St. Johns the trunk is often covered with the trumpet creeper (*Tecoma radicans*), or it is hidden by the dense foliage of the cross-vine (*Bignonia capreolata*), both of which form a beautiful ornament, especially when in flower. These suggestions of nature are often followed by planters who have a feeling for nature-like landscape effects. The Cabbage Palmetto thrives even in the poor sandy soil, and it is greatly improved by cultivation. Even good-sized trees are not difficult to transplant if the whole stem is carefully dug out and all of the roots and leaves are cut off. If the stem has been set at least three feet deep and the soil is kept well watered after planting, the Palmetto is almost sure to live. In addition to the Palmetto, all of the Sabals mentioned in this work are cultivated by the undersigned on high pine land in southern Florida. Under these conditions the Sabals have proved a great success, as also all species of Phœnix and all Cocos of the australis type, while the species of Washingtonia, Erythea, Livistona and Trachycarpus have been an entire failure. *S. Blackburnianum* is, in the judgment of the undersigned, the finest of all the fan-leaved palms that can be grown in Florida.

All the species that form trunks are objects of great beauty when well grown. They need to be well fertilized, or the lower leaves will suffer and finally die, thus detracting much from the elegance of the specimen. They all grow naturally in rich black soil, but they all thrive exceedingly well in the sandy pine woods soil if well fertilized and watered; in fact, they can hardly be fertilized too much, and the more nitrogenous manure and water they get the faster they grow. When transplanted they must be set deep. In planting palms the writer always makes a hollow about 6 ft. in diameter and about 2 ft. deep in the center. This center, which receives the plant, is the deepest point, while the ground all around is slightly sloping. Care must be taken to remove the sand after heavy rains or the crown will soon be buried and the little plant dies. As the plant first forms the trunk in the soil and as the growth is rather rapid, this precaution is not necessary after the plant has attained a few feet in size. H. NEHRLING.

The Cabbage Palmetto (*Sabal Palmetto*) is rich in historical associations. It is also noted for its imperishability under water. The trunks make good piles for wharves, as they resist the attacks of the borer in sea water. The leaves make the best of thatching. Until the tree reaches a height of 10–20 ft. the bases of the leaf-stalks remain upon the trunk, forming a unique *chevaux de frise*, which adds much to its picturesqueness. This palm, when pot-grown, is valuable for greenhouse culture at the North.

The Dwarf Palmetto can resist as low a temperature as 10–17° F. The graceful flower-spike rises above the leaves to a height of 6 or 7 feet.

S. longipedunculatum somewhat resembles the Cabbage Palmetto, and its flower-spikes extend far above the leaves. E. N. REASONER.

INDEX.

Adansoni, 1.
Blackburnianum, 4.
cærulescens, S. L.
dealbatum, S. L.
Ghiesbreghtii, S. L.
glaucum, S. L.
glaucescens, 2.
Havanensis, S. L.
Hoogendorpi, S. L.
Javanicum, S. L.
longifolium, S. L.
longipedunculatum, S. L.
mauritiæforme, 2.
Mexicanum, 5.
minor, 1.
minus, 1.
Mocini, 3.
Palmetto, 3.
princeps, S. L.
umbraculiferum, 4.
Uresana, S. L.

A. *Leaf-blade longer than petiole.*
  B. *Trunk none*....................1. **Adansoni**
  BB. *Trunk finally 60 ft*............2. **mauritiæforme**
AA. *Leaf-blade shorter than petiole.*
  B. *Shape of blade cordate*.......3. **Palmetto**
  BB. *Shape of blade orbicular.*
    C. *Lobes rather rigid*.........4. **Blackburnianum**
    CC. *Lobes pendent*.............5. **Mexicanum**

2224. The Palmetto in Florida—Sabal Palmetto.

1. **Adansoni**, Guerns. (*S. minus* or *minor*, Pers. *Corypha minor*, Jacq. not Linn.). DWARF PALMETTO. BLUE PALM. Stem short, buried in the earth: lvs. 2–3 ft. long; blade circular in its outline, somewhat longer than the petiole, glaucous; segments slightly cleft at the apex: spadix erect, much longer than the lvs., 3–6 ft.: drupe ⅜ in. thick, black. Southern states. B.M. 1434.

2. **mauritiæfórme,** Griseb. & Wendl. Also spelled *mauritiiformis*, etc. Trunk middle-sized, but occasionally attaining 60–80 ft.: lvs. finally 12 ft. across; blade suborbicular, longer than the petiole, glaucous beneath, multifid to the middle, with loose fibers between the bifid lobes. West Indies.—The name *mauritiæforme* does not appear in the American trade, but *S. glaucescens*, Lodd. and Hort., probably belongs here, according to Grisebach. Nehrling writes: "*S. glaucescens* of the trade rivals *S. umbraculiferum* in beauty and rapidity of growth. Its leaves, though smaller, have a beautiful bluish green color."

3. **Palmétto,** Lodd. CABBAGE PALMETTO. Fig. 2224. Stem erect, 20–80 ft. high: lvs. 5-8 ft. long, cordate in outline, recurved at the summit, shorter than the petiole; segments deeply cleft; spadix spreading, shorter than the lvs.: drupe black, ⅓–½ in. long. Southern states. S.S. 10:507. A.F. 12:628.—*S. Mocini*, Hort., is referred to *S. Palmetto* by Voss, but Nehrling describes it as a stemless plant from Mexico, more beautiful than the Dwarf Palmetto, bearing immense lvs. on strong stalks, the lvs. attaining a height of 6–8 ft. *S. Palmetto* has been confused in the European trade with *S. Mexicanum*.

4. **Blackburniànum,** Glazebrook (*S. umbraculiferum*, Mart.). Stem 30–40 ft. high, thickened at the middle: blade ample, orbicular, glaucous, rather rigid, shorter than the petiole; lobes about 40, ensiform, bifid, filamentous, rather rigid. West Indies. G.F. 4:307. G.C. II. 2:777. Loudon's Gard. Mag. 5:52–57, with several figures.—This species has also been confused in the trade with *S. Mexicanum*.

5. **Mexicànum,** Mart. Stout tree, with trunk sometimes 50 ft. tall and 2 ft. in diam.: lvs. very large, sometimes 6 ft. long and 7 ft. wide, divided to the middle into many narrow 2-parted segments, which are filamentous on the margins: fr. ⅓ in. in diam., globose or sometimes 3-lobed, with thin dry flesh. Tex., Mex. S.S. 10:508.—Nehrling writes: "This species is more robust than those native to Florida; it forms a broader and denser crown of lvs. and grows more quickly."

The following are mostly trade names, but at present they can be only imperfectly described: *S. cæruléscens*, W. Bull. A native of Colombia introduced in 1875. Apparently only the juvenile state has been described. Lvs. elongate, linear-lanceolate, plicate, with a bluish or glaucous green color which is very strongly marked on the under surface. Nehrling writes that he cannot distinguish at present his specimens of S. cærulescens from S. glaucescens.—*S. dealbàtum*, Hort. "This species," writes Nehrling, "reminds one of S. Mocini, although it is smaller in all its parts. The leaves are numerous, glaucous green and of a fine fan-shaped form. Compared with the Sabals that form a trunk, these stemless species have little beauty, though they look well as foliage plants in company with Cycas revoluta and Dioon edule." The name "dealbatum" means whitened.—*S. Ghiesbreghtii*, Hort., is very similar to S. umbraculifera, according to Nehrling.—*S. glaùcum*, Hort., Pitcher and Manda, 1895, may possibly be meant for S. glaucescens.—*S. Havanénsis*, Lodd., according to Nehrling, "is a more upright grower than S. Blackburnianum, has a slender stem and the leaf-stalks are longer and thinner. The leaves have a bluish green color while young, changing to a fine dark green when they get older." Habitat unknown.—*S. Hoogendorpi*, Hort., is cult. by Nehrling.—*S. Javánicum*, Hort., Pitcher & Manda, is possibly meant for S. Havanensis, since Sabal is an American genus and is not known in Java.—*S. longifòlium*, Hort., according to Nehrling "has very numerous, long and slender lvs. which are bright green above and silvery below."—*S. longipedunculàtum*, Hort., according to Nehrling, "is a stemless plant with smaller lvs. than those of S. Mocini and very long and slender stalks." Reasoner adds that the lvs. are glaucous green.—*S. príncepa*, Hort., according to Nehrling, "is very similar to S. umbraculifera.—*S. Uresàna*, Trelease. Trunk 15 or 35 ft. high and upwards of 1 ft. in diam.: lvs. glabrous, very glaucous; petiole stout, concavo-convex, unarmed, about 40 in. long, nearly 1 in. wide and nearly 2-5 in. thick: blade about 40 in. long and wide, multifid, with coarse straw-colored fibers from the sinuses, the center arcuately recurved: fr. of a single developed carpel, depressed globose, ¾ in. or less in diam., edible, green, or when dry dingy brown and somewhat glossy, the mesocarp then cottony: endocarp whitish straw-color, glossy within; seed polished, dark chestnut-brown, labyrinthiform-rugose, much depressed. Sonora, Mexico, in the vicinity of Ures. Described and figured in vol. 12 (1901) of Rept. Mo. Bot. Gard. "From the two arboreous palmettos of the United States, S. Uresana differs markedly in its pale, very glaucous foliage, and in the size of its fruit, which is of thrice the diameter of that of S. Palmetto, and usually a third larger than in S. Mexicana, with the former of which species it agrees in having but one of the three carpels developed and fertile, while in S. Mexicana two or even all three are not infrequently developed. Considering the extent to which this section of Mexico has been visited by collectors of seeds it would be remarkable if this attractive plant should not prove to be already in cultivation in European gardens." Possibly already in cult. in this country.

W. M.

SABBÀTIA (Liberatus Sabbati, Italian botanist of the eighteenth century). *Gentianàceæ.* About 13 species of Atlantic North American annuals or biennials with showy rose-pink or white fls. in summer or autumn. Fls. 5–12-merous, in cymes or terminating the branches; calyx 5–12-cleft; corolla rotate, usually with a yellow eye, the lobes convolute in the bud; filaments rather short, filiform; anthers linear or elongate oblong, arcuate, recurved or revolute; style 2-cleft or parted: capsule globose or ovoid, thick-coriaceous or at first fleshy: seeds small, numerous.

Sabbatias require a light, sweet soil. Seed may be sown in fall or early spring. The plants are easily transplanted.

A. *Fls. 5-parted, rarely 6–7-parted.*

B. *Lvs. narrow-oblanceolate to linear.*

C. *Color of fls. rose to white: lvs. obtuse.*

brachiàta, Ell. Stem but slightly angled, 1–2 ft. high: lvs. mostly obtuse, obscurely 3-nerved at the base: fls. showy, light rose to white, 1–1½ in. across, in thyrsiform panicles, the lateral peduncles bearing usually 3-fld. cymes; calyx-lobes narrowly linear, shorter or nearly equaling the corolla. May–Sept. Ind. to N. C. and south. B.B. 2:609.

CC. *Color of fls. white, fading yellowish: lvs. acute.*

lanceolàta, Torr. & Gray. Stem simple, 1–3 ft. high: lvs. about 1 in. long, shorter than internodes, acute, 3–5-nerved, the floral reduced to subulate bracts: fls. about 1 in. across, white, fading yellowish; calyx-lobe more than half the length of the corolla. May–Sept. Wet pine barrens, N. J. to Fla. B.B. 2:609.

BB. *Lvs. wider, cordate-ovate, clasping.*

angulàris, Pursh. Stem sharply angled, 1½–2 ft. high: lvs. 3–5-nerved: fls. fragrant, showy, light rose to white, 1–2 in. across, in much-branched pyramidal or somewhat corymbose cymes; calyx-lobes linear, much shorter than the corolla. Rich, light soil in open fields. W. Canada to Fla. B.B. 2:610.

AA. *Fls. 8–12-parted.*

chloroides, Pursh. Stem truly biennial, 1–2 ft. high, often decumbent, loosely and sparingly branched above: lvs. oblong-lanceolate or the lower oblong-spatulate: fls. rose-purple, occasionally white, 2 in. across, showy, solitary on naked, somewhat paniculate peduncles; calyx-lobes subulate-linear, about half the length of the spatulate-obovate lobes of the corolla. Margins of pine barren swamps along the coast. Mass., Fla. B.B. 2:612.

F. W. BARCLAY.

SACCHÁRUM (*saccharon*, old Greek name for sugar). *Gramíneæ.* Species 12, in tropical regions, mostly of the Old World. Tall grasses with stout culm and ample panicles, the branches of which are many-jointed; the small, slender spikelets 1-fld., surrounded by long silky hairs. Differs from Erianthus in having the spikelets awnless. The most important species is the Sugar Cane, which is extensively cultivated in tropical and subtropical countries for the production of sugar. Propagated by cuttings of the stem. Native country unknown, but probably east Asia. Cultivated from time immemorial, for which reason many varieties have lost the power to produce bloom or at least to produce fertile seed. Rum is produced from the fermented molasses.

officinàrum, Linn. SUGAR CANE. Stem 8–20 ft. high, 1–2 in. thick, third empty glume wanting.

A. S. HITCHCOCK.

SACCOLÀBIUM (name referring to the saccate labellum). *Orchidàceæ.* Epiphytic herbs with erect leafy stems increasing in length by continued growth at the apex: lvs. distichous, leathery and fleshy, usually channeled; inflorescence lateral, in the cultivated species a long, densely-fld. cylindrical raceme: fls. medium or small; sepals subequal, free, spreading, the lateral pair not decurrent on the base of the column; petals similar, sometimes wider; labellum united with the base of the column, spurred, the mouth of the spur open; pollinia on a filiform stipe. About 20 species. Can be propagated by offsets and by cut-backs. Fresh stock is constantly imported. HEINRICH HASSELBRING.

This interesting genus embraces a number of pretty and distinct species from Borneo, Cochin China, India, Java and Manila. They are closely allied to the genera Aërides, Phalænopsis and Vanda, and require somewhat similar treatment, but do not always acclimatize themselves as readily to artificial cultivation unless given a location with more or less natural surroundings, though some of the more free-growing species, like *S. ampullaceum*, *S. curvifolium*, *S. cœleste* and *S. Hendersonianum*, can usually be grown successfully in the Cattleya or Cypripedium department. The large-growing species with thick, succulent leaves require a warm, moist atmosphere where the winter temperature can be retained at 65° to 70° F. by night and about 75° during the day, and in the summer or growing season 10 degrees in advance of this.

All succeed best when suspended from the roof in pans, baskets or on blocks where they can have free circulation of air about them at all times, receive indirect benefit of the sun's influence, which will harden their tissue, and where the compost may readily and frequently dry out, during the resting period especially. Grown otherwise the more succulent species, such as *S. giganteum* (a Vanda), make soft, weak tissue, which is susceptible to wet spot, a usually fatal disease. Clean, chopped sphagnum, freely interspersed with broken pieces of charcoal, is the most satisfactory growing material, and this should not be pressed in so firmly as to entirely exclude access of air to the roots, but the plants must always be firmly secured with pieces of charcoal, potsherds or other similar material, or securely fastened with copper wire to keep them in position, otherwise being more or less top-heavy they are liable to work loose, under which conditions they cannot become properly established.

Shading should be applied to the glass from February until November to break the sun's direct rays, but during the balance of the year when the solar light is weak its direct influence will be found beneficial. In bright weather during the growing season the plants need a liberal supply of water, both at the roots and over the foliage, but during the resting period and in wet, inclement weather, water and syringing must be carefully and sparingly administered. Judgment in this respect is very essential to the successful culture of these plants. The supply of Saccolabiums is kept up by fresh importation. These cultural directions apply also to the genus Rhynchostylis. ROBERT M. GREY.

A. *Fls. rose-colored.*

Hendersoniànum, Reichb. f. Dwarf: lvs. 4–6 in. long, strap-shaped, subacute, distichous on the stems, but spreading in various directions: raceme upright, about as long as the lvs.: fls. forming a cylindrical mass, bright rose, ⅜ in. across; dorsal sepals orbicular, concave, lateral ones larger, obovate-oblong; petals obovate; labellum a blunt, straight spur with 3 teeth at the mouth, white. Borneo. B.M. 6222.

ampullàceum, Lindl. Fig. 2225. Dwarf: stem 6–8 in. high, with 2 rows of lvs.: lvs. strap-shaped, channeled, apex truncate and dentate: racemes nearly erect, 4–6 in. high: fls. deep rose color; sepals and petals ovate, veined, spreading out flat; labellum linear-falcate, one-half as long as the petals; spur slender, straight. May, June. N. India. B.M. 5595. P.M. 13:49. J.H. III. 32:463.—Var. **Moulmeinénse**, Hort., is a geographical variety with stronger growth and larger fls.

AA. *Fls. orange or scarlet-orange.*

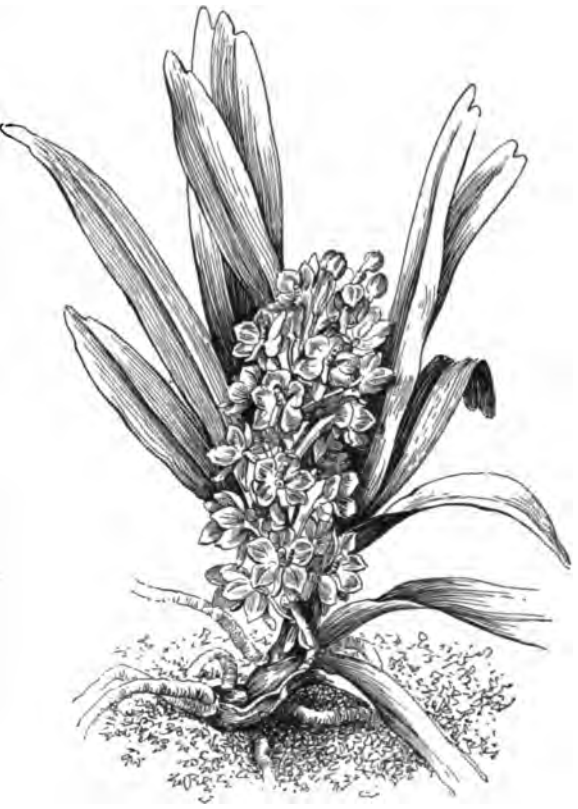
curvifòlium, Lindl. Stems short: lvs. linear, 8–10 in. long, 2-toothed at the apex: racemes somewhat drooping, 6 in. long, dense: fls. 1 in. across, bright orange scarlet; sepals and petals ovate to obovate, spreading; labellum orange, blade linear, truncate, spur obtuse. May, June. Burma. Java. B.M. 5326 (as *S. miniatum*). I.H. 13:493.

cerinum, Reichb. f. Stem short, thick: lvs. strap-shaped, obtusely 2-lobed: raceme dense, half drooping: fls. orange, with a paler spur; sepals oblong; petals ovate. Sunda Islands.

AAA. *Fls. white, spotted with blue.*

cœléste, Reichb. f. Plant rarely 1 ft. high, with decurved lvs. and erect, densely fld. racemes 6–9 in. long: fls. white, with the front of the lip and the tips of the segments sky-blue; sepals and petals cuneate, oblong, obtuse; labellum rhomboid, spur compressed, curved. July, Aug. Siam. J.H. III. 28:87.

S. Blùmei, Lindl.—Rhynchostylis retusa.—*S. gigantèum*, Lindl.—Vanda densiflora.—*S. guttàtum*, Lindl.—Rhynchostylis retusa.—*S. Harrisoniànum*, Hook.—Rhynchostylis violacea, var. Harrisonianum.—*S. illùstre*, Hort., probably—Vanda densiflora, var. illustre.—*S. præmórsum*, Lindl.—Rhynchostylis retusa.—*S. retùsum*, Voigt—Rhynchostylis retusa.—*S. Rheèdii*, Wight—Rhynchostylis retusa.—*S. violàceum*, Reichb. f.—Rhynchostylis violacea. HEINRICH HASSELBRING.



2225. Saccolabium ampullaceum (× ½).

SACRED BEAN of Egypt. *Nymphæa Lotus.*

SACRED BEAN of India. *Nelumbo nucifera.*

SADDLE TREE. Rare name for Tulip-tree, *Liriodendron.*

SAFFLOWER. *Carthamus.*

SAFFRON. *Crocus sativus.*

SAFFRON, FALSE. *Carthamus tinctorius.*

SAFFRON, MEADOW. See *Colchicum.*

SAFFRON THISTLE. *Carthamus tinctorius.*

SAGE (*Salvia officinalis*). For at least three centuries this shrubby, fibrous-rooted perennial from southern Europe has been widely cultivated in kitchen gardens for its aromatic, whitish green, wrinkled, oval leaves. These are arranged oppositely on ascending or decumbent branching stems which seldom exceed 18 in. in height. In early summer the upper parts of these bear generally blue, though sometimes pink or white flowers, followed by almost black spheroidal seeds borne in the open cups. The name *Salvia* is derived from *salvo*, to save, in reference to the plant's use in ancient medicine; the name sage, from its supposed power to make people wise by strengthening the memory. In modern medicine it is but little used. In domestic practice it is, however, credited with tonic, sudorific, carminative, anthelmintic and stomachic properties, and is frequently used as a gargle for aphthous affections of the mouth and pharynx. Its pleasant, though powerful-smelling, bitterish leaves are used for flavoring sausages and some kinds of cheese, for seasoning soups and stews, but mainly for dressings with luscious, strong meats such as pork, goose and duck. Among culinary herbs it ranks first in America, being more widely cultivated than any other except parsley, which is more largely employed for garnishing than as a flavoring agent. When possible the young leaves should be used fresh, for unless carefully dried they lose much of their aroma, which is due to a volatile oil and which even with careful curing rapidly dissipates. For best results the shoots should be gathered before flower-stems develop, because they are then richer and because later cuttings may be made. For drying upon a commercial scale, since this plan is thought to involve too much labor, the plants are cut in August if seed has been sown early, and the stumps, if not too short, produce again in late autumn; or if grown as a secondary crop, which is the common way, they are cut only once—namely, in autumn. Plants grown from cuttings (see below) will often produce three crops in a season. Upon a small scale a warm, airy room is best for drying, the plants being either laid loosely upon racks or the floor, or hung from the ceiling and walls. Upon a larger scale a fruit evaporator with a steady current of warm air at about 100° F. may be used. After drying, the leaves are rubbed to a powder and stored in air-tight vessels.

Sage does best in an open, sunny aspect and a well-drained, mellow loam of medium texture, rich in humus and nitrogenous matter. Stable manure or a fertilizer containing potash, phosphoric acid and nitrogen should be applied before the plowing, if done in the spring. Fall plowing is generally preferred where Sage alone is to occupy the land. In each case plowing should be as deep as the surface soil will profitably permit. Thorough fining of the soil must precede, and clean cultivation follow planting, the plants being set in drills about 15 in. apart and 10 in. asunder for manual cultivation or 18–21 in. apart and 10 in. asunder for power cultivation. The former method is, as a rule, more profitable though more laborious. After harvesting (see above) if the bed is to be permanent, northern plantations should be mulched with marsh hay or other material free from weed seeds. For garden practice it is common to divide the clumps biennially, since the plants become straggling if left longer. Upon a commercial scale, however, it is better to rely upon cuttings or seedlings. Propagation may be effected by seed, cuttings, layers or division. Seed, the vitality of which lasts three years, may be drilled thinly in flats in greenhouse, hotbed or coldframe in early spring; or out of doors, as soon as the ground becomes dry enough, in specially prepared beds of fine soil, covering them about ½ in. deep. In the former case the plants must be pricked out and hardened off to render them stocky and hardy before transplanting; in the latter, they are taken directly to the field. This operation may be performed from mid-June until late July, the plants being not less than 2–3 in. tall. The former method, which is considered the better, is the common commercial practice. Cuttings may be of mature or of immature wood. With each, shade and moisture are essential to success. Mature wood cuttings, made in early spring, should be ready for the field in less than six weeks; immature, taken from outside shoots just before they would form blossom heads, are left in the cutting bed until the following year. Such plants are usually more prolific than those grown from mature wood or from spring seedlings, and are, therefore, best when Sage alone is to occupy the land. But when it is to follow some early vegetable, mature wood cuttings or seedling plants will probably be found best, though little or nothing can be cut before September. As practiced by market-gardeners in the vicinity of New York each of the above methods has its advocates, but practically all agree upon the plowing and harrowing of the ground in June or July after harvesting an early crop, such as beets, cabbage or peas. About twice in the three weeks after setting the plants the field is raked to destroy sprouting weeds and to keep the surface loose, after which, if well done, but slight hoeing is necessary. In September, when the plants crowd each other, each alternate plant or row of plants is cut for sale and the remainder allowed to fill the space. At the first cutting each plant should make about two marketable bunches; at the second at least three. This practice not only insures plants full of leaves at each cutting but at least double the quantity in the end.

In America the green, broad-leaved varieties are in far greater demand than the colored and the narrow-leaved kinds. The best variety known to the writer is Holt Mammoth, which is exceptionally prolific of large leaves. It is said to produce no seed. M. G. Kains.

SAGE BRUSH. Species of *Artemisia*.

SAGE, JERUSALEM. See *Phlomis*.

SAGÈNIA (derivation unknown). *Polypodiàceæ*. A genus of ferns, mostly of large and coarse habit, with superior reniform or heart-shaped indusia fixed by the sinus, as in Dryopteris, but with veins uniting freely to form areoles with free included veinlets. About 25 species are known, largely from the East Indies, a few from tropical America.

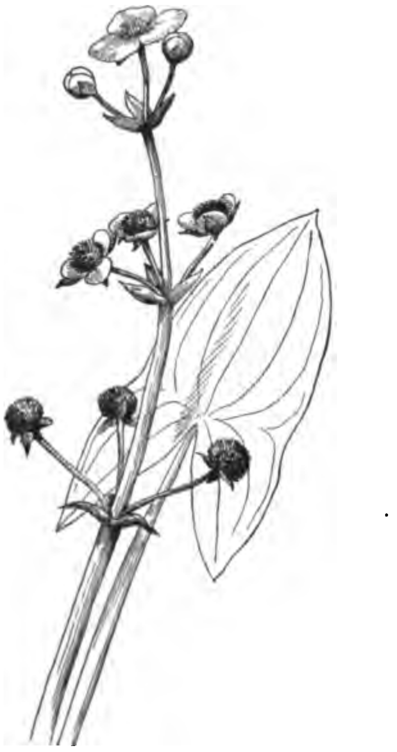
decúrrens, Presl. Leaf-stalks narrowly winged from a creeping rootstock: lvs. 2–4 ft. long, 1 ft. or more wide, cut down to a winged rachis and with 4–8 pairs of pinnæ 6–12 in. long, 1–2 in. wide: sori large, in two regular rows between the principal veins. India to Polynesia. L. M. Underwood.

SAGÌNA (Latin, *fatness*; perhaps alluding to the forage value. *Caryophyllàceæ*. Pearlwort. About 8 species of annual or perennial tufted herbs, mostly from the temperate regions of the world. Lvs. awl-shaped: fls. small, usually comparatively long-stemmed; sepals 4–5; petals 4–5, entire or slightly emarginate, minute or none; stamens equal in number to the sepals or twice as many: ovary 1-loculed, many-seeded: styles of the same number as the sepals and alternate with them.

subulàta, Wimm. (*S. pilifera*, Hort. *Spérgula pilifera*, Hort. *Spérgula subulàta*, Sw.). Pearlwort. An evergreen, hardy, densely tufted little plant, covering the ground like a sheet of moss: lvs. very small, stiff, aristate on the margin, linear: stems branching and creeping: fls. white, studded all over the plant on long, very slender peduncles. July–Sept. Corsica. R.H. 1896, p. 435. R.B. 20:153.—Var. **aùrea** has lvs. marked with yellow. A good rock-plant in shady places. Cult. similar to Arenaria. Prop. by division.

F. W. Barclay.

SAGITTÀRIA (*Sagitta* is Latin for arrow). *Alismàceæ*. Arrowhead. A small genus of very variable aquatic plants, the number of species depending on the point of view of each author. Nearly or quite 100 specific names occur in the genus, but Micheli, the latest monographer (DC. Monogr. Phaner. 3) reduces the species to 13, four of which are doubtful. In his monograph of the American forms (6th Rep. Mo. Bot. Gard.) Jared G. Smith admits 21 species. The present tendency amongst American writers is to recognize several rather than few species. In common with most aquatic plants, they are widely distributed. They occur in many parts of the world, in both temperate and tropical regions. Most of the species have arrow-shaped leaves, whence the name. They are useful for foliage effects in bogs and shallow ponds, and also for their white buttercup-like flowers, which are borne in successive small whorls on an erect scape. They are mostly used for colonizing in the open, but *S. Montevidensis*—now the most popular species—is grown in indoor aquaria or plunged in open ponds in the summer. The arrowheads are perennials of easy culture, although likely to be infested with aphis. Prop. by division, or sometimes by seeds.



2226. Common Arrowhead—Sagittaria latifolia (× ½). Commonly known as *S. variabilis*.

Plants of mostly erect habit, the lvs. and scapes arising from more or less tuberous or knotted rootstocks: lvs. typically arrow-shaped, with long basal lobes, but sometimes long and linear: fls. imperfect, monœcious (staminate fls. usually in the uppermost whorls) or diœcious, with 3 white broad petals and 3 small greenish sepals, the stamens and pistils numerous, the latter ripening into small akenes: inflorescence composed of successive whorls of 3-stalked fls. Sometimes the lvs. are floating.

A. *Sepals of pistillate fls. (usually in the lower whorls) erect after flowering, and the pedicels of these fls. thick: carpels not glandular.*

Montevidénsis, Cham. & Schlecht. GIANT ARROWHEAD. Very large, sometimes growing 6 ft. tall, with leaf-blades 1–2 ft. long: lvs. arrow-shaped, with long, diverging, sharp basal lobes: fls. very large (2 to nearly 3 in. across), the rounded petals white with a purple blotch at the base. Argentina to Brazil, Chile and Peru. B.M. 6755. Gn. 27:473. I.H. 31:543.—First known as a cult. plant from seeds sent to England in 1883 from Buenos Ayres by John Ball. It is now a popular plant for aquaria and lily ponds. Tender to frost. It is sparingly naturalized in the southern parts of the U. S., on both the Atlantic and Pacific sides.

AA. *Sepals of pistillate fls. reflexed after flowering: pedicels of these fls. slender: carpels somewhat glandular.*

B. *Bracts at base of whorls united, as if only 1.*

pusílla, Nutt. (*S. nàtans*, in part. *S. subulàta*, Buch.). Slender and simple, usually only a few inches high: lvs. linear or narrowly oblanceolate, rigid: fls. few, usually in 1 whorl, white, ½–¾ in. across, the filaments broad. N. Y. to Ala., along the coast.—Offered by dealers in native plants.

BB. *Bracts 3, at base of the whorls.*

C. *Lvs. usually distinctly sagittate.*

latifòlia, Willd. (*S. variàbilis*, Engelm. *S. sagittæfòlia*, var. *variàbilis*, Michx.). Fig. 2226. Very variable in stature and shape of lvs., ranging from a few inches to 3–4 ft. tall: lvs. mostly broad-sagittate with long basal lobes, but running into very narrow forms: fls. clear white, about 1 in. across, usually monœcious, the filaments slender: akene winged, with a lateral or oblique beak. Common everywhere in margins of ponds and lakes, and offered by dealers in native plants for colonizing in bog gardens and in lily ponds.

sagittæfòlia, Linn. OLD WORLD ARROWHEAD. Rhizome thick and tuberous, stolon-bearing: lvs. broad and sagittate, very variable in form and size: scapes erect, simple or branched, overtopping the lvs.: bracts narrow-ovate, free or slightly connate at base, shorter than the pedicels: petals large, white; filaments glabrous: akene nearly or quite orbicular and in this respect differing from the allied American species. Throughout Europe and Asia.—By some authors the American *S. latifolia* and others are considered to be con-specific. There is a form with double fls. (var. *flore-pleno*, Hort. *S. Japonica*, Hort.). *S. Chinensis* of most trade lists is apparently one of the many forms of this species. There appears to be another *S. Chinensis* in the trade, with lanceolate lvs., the botanical position of which is undetermined.

CC. *Lvs. usually oblong or linear and not sagittate.*

D. *Filaments slender, tapering upward, cobwebby.*

lancifòlia, Linn. Erect and somewhat rigid, glabrous, the scape sometimes reaching 5 ft.: lvs. lanceolate to narrow-oblong to nearly linear, nerved from the thick midrib: fls. white, in several whorls. Swamps, Del. to the tropics.

DD. *Filaments abruptly broadened, pubescent.*

gramínea, Michx. Erect and simple, glabrous, 2 ft. or less high: lvs. reduced to phyllodia, flat, broad-linear to lance-elliptic, pointed: fls. small, white, in 2 or 3 whorls.

L. H. B.

SAGO PALM. Consult *Cycas*.

SAINFOIN, or SAINTFOIN. *Onobrychis viciæfolia.*

ST. ANDREW'S CROSS. *Ascyrum Crux-Andreæ.*

ST. DABEOC'S HEATH. See *Dabœcia*.

ST. GEORGE'S HERB. *Valeriana officinalis.*

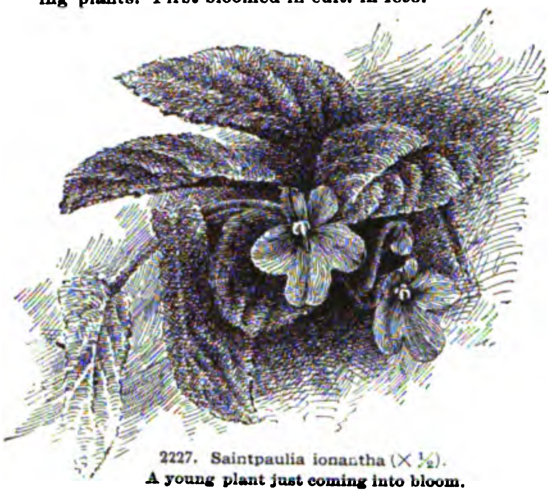
ST. JOHN'S BREAD. *Ceratonia Siliqua.*

ST. JOHN'S-WORT. See *Hypericum*; also *Symphoricarpus*.

ST. PATRICK'S CABBAGE. *Saxifraga umbrosa.*

ST. PETER'S-WORT. *Ascyrum stans.* Also applied to species of Hypericum, Primula and Symphoricarpus.

SAINTPAÙLIA (from the discoverer of the plant, Baron Walter von Saint Paul). *Gesneràceæ.* USAMBARA VIOLET. A monotypic genus from eastern tropical Africa, where it was found growing in wooded places in fissures of limestone and granite rocks, in rich, light soil. It is a stemless hairy perennial herb with short-petioled ovate or oblong-cordate lvs. 1–2 in. long and nodding blue fls. 1 in. across, borne in stout peduncled few-fld. cymes: sepals 5–7, linear, obtuse, erect, green; corolla sub-rotate, the tube shorter than the sepals; limb 2-lipped, the upper lip 2-lobed, and much the smaller, the lower spreading, all lobes rounded, concave, ciliolate; stamens 2, inserted in the contracted mouth of the tube; filaments short, stout: ovary ovoid, hirsute; style filiform; stigma purple: seeds many, very minute. One of the choicest of blue winter-flowering plants. First bloomed in cult. in 1893.



2227. Saintpaulia ionantha (× ½).
A young plant just coming into bloom.

ionántha, Herm. & Wendl. African Violet. Usambara Violet. Fig. 2227. B.M. 7408. Gn. 47:1002. A.G. 16:369. R.B. 20:109. R.H. 1893, p. 321. G.M. 37: 62. G.C. III. 13:685. Century Book of Gardening, 311. —Of its propagation and culture G. W. Oliver says: "The end of March is a good time to propagate, when the ripened leaves should be cut off with about an inch of the stalk attached, and inserted in the sand bed, covering only a small part of the leaf-blade. The sand should not be kept too wet during the process of rooting. Their propagation from seed and general culture is similar to that of Gloxinia. The plants may be flowered the entire year or given a period of rest by partly withholding water." F. W. Barclay.

SALAD PLANTS. The principal salad plant in America is the lettuce, which is used exclusively, but not always expertly, for salads. For full directions for growing lettuce in the garden and under glass, see *Lettuce*. Next to lettuce the best known salad plant in this country is probably endive, which is excellent, especially when well-blanched plants are to be had in the winter. Chicory is much like endive, as regards its treatment either in the garden or in the salad dish. Like endive, it is frequently seen in the larger city markets. The common dandelion should be mentioned in this category. When forced and blanched it makes a salad fit for the most cultivated epicure. For ordinary home cultivation and use, however, the common garden cress (*Lepidium sativum*, not water cress, nor upland cress) ranks next to lettuce in value. Its rapid growth and high flavor equally recommend it. This plant is said to be a great favorite in English gardens and forcing houses, where it is grown in mixture with white mustard and is pulled very young and eaten roots and all. Corn salad is another plant sometimes grown in gardens and used for salad-making. It is most acceptable to those who do not relish the pungency of mustard and cress. Cives is used by many people as an ingredient of lettuce and other salads; also young onions. Many other plants are used in various places and by various persons for salads.

Besides the salad plants proper, many vegetables are used in a cooked or raw condition for salads. Such are cabbage, cauliflower, brussels sprouts, potatoes, lima beans, beets, Jerusalem artichoke, etc. With salad plants may also be included pot-herbs, or "greens." The plants especially to be mentioned in this category are Swiss chard, beet tops, spinach, kale, endive, and mustard. Many other plants find occasional or local favor. See *Greens*.

The only general cultural directions which can be given for salad plants are that blanching is often desirable and a quick unchecked growth is always a requisite. An abundance of rapidly available fertilizer and plenty of water are therefore to be insisted on. A warm, light soil, in the best mechanical condition, is necessary for the same reasons. F. A. Waugh.

SALICÓRNIA (Latin, *salt* and *horn;* saline plants with horn-like branches). *Chenopodiàceæ.* Glasswort. Marsh Samphire. A genus of about 8 widely scattered species of leafless seashore herbs, hardy or tender, annual or perennial. This and other chenopods which grow in large quantities in the Mediterranean region were formerly used in making soap and glass, as they yield a large percentage of soda. The ashes of such plants were known to the trade as barilla. The species have probably never been in cultivation and have no horticultural interest.

SALISBURIA. See *Ginkgo.*

SÀLIX (ancient Latin name of willow). *Salicàceæ.* Willow. A genus of trees and shrubs characterized by simple lvs.: buds with a single bud-scale: lvs. in lax scaly spikes (aments): the fls. subtended by a single entire scale and nearly or quite destitute of perianth; the staminate fl. with 1, 2, or 3–6 stamens; the pistillate fl. of a single pistil composed of 2 carpels and 2 more or less divided stigmas; at maturity the pistil dehisces, setting free the small appendaged seeds. The wood is light, soft and diffuse porous. For the staminate and pistillate flowers of Willow, see Figs. 831 and 833, Vol. II. The catkins or "pussies" are also shown in Figs. 2228 and 2229 herewith.

The role that the Willow plays in the north temperate regions is to a certain extent analogous to that of the Eucalyptus in subtropical regions in that it flourishes in wet ground and absorbs and transpires immense quantities of water. It has been used to plant around cesspools for sanitary effect. But while most of the species occur spontaneously in wet ground or along stream banks, the Willows may be cultivated in various situations. The White Willow (*S. alba*) has been used very effectively to fix stream banks against erosion. Figs. 2230, 2231. Its root system is very extensive and when well established withstands the effect of heavy rapid streams as well as wave action.

All species are readily propagated by cuttings. It has been suggested that the brittleness at base of twigs of some species, notably the Black Willow (*S. nigra*), is an adaptation to facilitate naturally the distribution of the species. Certain it is that twigs broken from the tree by the wind are carried down streams and, becoming anchored in the muddy banks, grow there. It is one of the most aggressive trees in occupying such places.

2228. Staminate catkin of Salix discolor. Natural size.

2229. Pistillate catkin of Salix discolor. Natural size.

2230. White Willow on a stream, holding the bank from washing. See No. 6.

2231. Same tree as in 2230, in summer dress.

The genus is represented by species in both continents. It is, however, much more abundant in north temperate regions than in south. In the frigid regions are several species. *Salix arctica* and several allied species are among the few woody plants extending into extreme arctic regions. The arctic species are among the most diminutive of woody plants. As one goes south the species increase in size. Some of the species of north temperate, tropical and south temperate zones are large trees. The arborescent species all form wood very rapidly. Specimens of White Willow which may not be of great age look venerable from their great thickness. The wood is light in weight and color, finely and evenly porous. The wood has been extensively used in the manufacture of gunpowder. It has also been used for many other purposes. Certain species have for many years been extensively cultivated in Europe for materials with which to manufacture baskets. *S. viminalis* appears to be the favorite species for this purpose. Basket Willow is now extensively cultivated in central New York, and considerable manufacturing of this material is done there.

As ornamental trees the Willows present little variety. The bright yellow catkins of some species are attractive in spring. They are considerably used as "nurse trees" for slower growing trees that require partial shade while young. The red and yellow branches of certain Willows are very bright and cheering in winter. The weeping forms are very popular, but they are often planted with little sense of fitness. The cultural remarks under *Populus* will apply to Willows.

Willows are rarely propagated from seed. The seeds are very small and contain a green and short-lived embryo. A very short exposure of the seeds to the air will so dry them out that they will not germinate. The safest way to secure seedlings is to plant the seeds as soon as the capsule opens. Many hybrids have been described based on specimens found in nature that presented characters intermediate between recognized species. Artificial hybrids have also been made between many species. The diœcious habit of the species seems to facilitate cross-pollination, and it seems probable that the intermediate forms so frequently met with and designated in the monographs as varieties are natural hybrids. Upwards of one hundred hybrid Willows have been described as growing in Europe. Although as many or even more species occur in America, fewer hybrids have been detected here. The hybrids described as growing in America are for the most part between native species and those introduced from Europe.

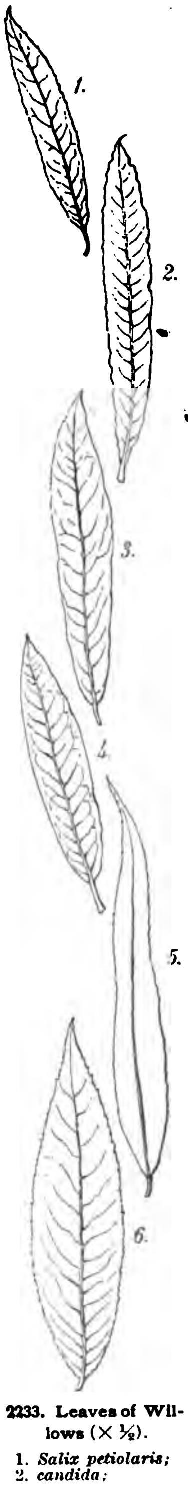
INDEX.

alba, 6.
amygdaloides, 2.
annularis, 8.
argentea, 6.
argophylla, 11.
aurantiaca, 7.
aurea, 7, 8.
Babylonica, 8.
Bebbiana, 14.
blanda, 7.
Britzensis, 7.
candida, 20.
Caprea, 12.
cordata, 22.
decipiens, 5.
discolor, 13.
dolorosa, 8.
elegantissima, 9.
Euphratica,
falcata, 1.
Forbyana, 25.
fluviatilis, 10.
fragilis, 5.
Hindsiana, 11.
humilis, 15.
incana, 24.
interior, 10.
irrorata, 23.
Japonica, 8.
Kilmarnock, 12.
laurifolia, 4.
longifolia, 10.
lucida, 3.
multinervis, 12.
myrtilloides, 21.
nigra, 1.
palmæfolia, 12.
pendula, 1, 7, 8, 12, 22, 25.
pentandra, 4.
petiolaris, 18, 24.
purpurea, 25.
regalis, 6.
rigida, 22.
rosmarinifolia, 24.
rostrata, 14.
rubra, 10.
Russelliana, 5.
Salamonii, 8.
sericea, 17.
Sieboldii, 9.
Sitchensis, 26.
splendens, 6.
Thurlow's, 9.
tricolor, 12.
tristis, 16.
viminalis, 19.
viridis, 5.
vitellina, 7.
Wisconsin Weeping, 8.

A. *Scales of ament green, deciduous. Mostly trees.*
B. *Stamens more than 3.*
C. *Buds small* .... 1. **nigra**
2. **amygdaloides**
CC. *Buds large: lvs. very shiny above* .... 3. **lucida**
4. **pentandra**

2232. Old roadside trees of Salix alba.

BB. *Stamens 2 or 3.*
C. *Large trees* .... 5. **fragilis**
6. **alba**
7. **vitellina**
8. **Babylonica**
9. **elegantissima**
CC. *Shrubs* ....10. **interior**
11. **argophylla**
AA. *Scales of ament black above, persistent. Mostly shrubs.*
B. *Stamens 2.*
C. *Capsules hairy*...12. **Caprea**
13. **discolor**
14. **Bebbiana**
15. **humilis**
16. **tristis**
17. **sericea**
18. **petiolaris**
19. **viminalis**
20. **candida**
CC. *Capsules glabrous*.21. **myrtilloides**
22. **cordata**
23. **irrorata**
24. **incana**
BB. *Stamen 1*............25. **purpurea**
26. **Sitchensis**



2233. Leaves of Willows (× ½).
1. *Salix petiolaris;*
2. *candida;*
3. *purpurea;*
4. *myrtilloides;*
5. *nigra;*
6. *fragilis.*

1. **nigra,** Marshall. BLACK WILLOW. Fig. 2233. Tree, 30–40 ft. high: bark flaky, often becoming shaggy: twigs brittle at base; buds small: lvs. lanceolate, green, both sides finely and evenly serrate: aments 1–2 in. long; scales oblong, deciduous; stamens 3–6: ovary ovate-conical, glabrous; style short but distinct. E. N. Amer. Var. **falcàta,** Pursh. Lvs. elongated, narrow and falcate. Var. **péndula** is cult.

2. **amygdaloides,** Andersson. PEACH-LEAF WILLOW. Tree, 30–40 ft. high: bark longitudinally furrowed, less inclined to be flaky: lvs. broader, glaucous beneath, on rather long, compressed petioles: aments loosely fld.: ovary lanceolate-conical; style very short. Central and western N. Amer.

3. **lùcida,** Muhl. Shrub or low, bushy tree, 6–15 ft. high: branches yellowish brown and highly polished: buds large, flattened and recurved at the apex: lvs. large, broadly lanceolate-acuminate, serrate, dark green, shining above: aments large, appearing with the lvs.; scale pale green, deciduous; stamens 4–5: ovary pedicelled, rather obtuse, glabrous. E. N. Amer.—A beautiful plant, deserving of more extensive cultivation.

4. **pentándra,** Linn. (*S. laurifòlia,* Hort.). BAY-LEAF OF LAUREL-LEAF WILLOW. Shrub or small tree, 8–20 ft. high: branches chestnut color: lvs. large, elliptic to broadly oblanceolate, acuminate, shining and dark green above, paler beneath; aments appearing after many of the lvs. are fully developed, not conspicuous. Europe and Asia.

5. **frágilis,** Linn. (*S. víridis,* Fries. *S. Russelliàna,* Sm.). BRITTLE WILLOW. Fig. 2233. Tree, 50–60 ft. high, excurrent in habit and of very rapid growth: branches brown, obliquely ascending: buds medium size, pointed: lvs. large, lanceolate, acuminate, glabrous or slightly hairy when young, scarcely paler beneath, glandular serrate: aments appearing with the lvs. (the staminate tree rare in America), seldom bearing good seed, slender; scales deciduous. Eu., N. Asia. Gn. 19, p. 517; 55, p. 89.—Frequently cultivated and also growing spontaneously in many places. A company of promoters induced many American farmers to plant hedges of this Willow some fifty years ago. Many of these occur now throughout the country, the trees being 40–50 feet high. A stake cut from a tree and driven in the ground will soon establish itself and grow into a tree. Var. **decipiens,** Hoffm. Twigs yellow: buds black in winter: lvs. smaller and brighter green. Probably a hybrid with another species.

6. **álba,** Linn. WHITE WILLOW. Fig. 2234; also 2230–2. Large tree, with short and thick trunk, not excurrent in habit: branches yellowish brown: lvs. ashy gray and silky throughout, giving a white appearance to the whole tree, 2–4 in. long, elliptical. Eu. Gn. 55, p. 87.—Heretofore associated with the next species, from which it differs in color of twigs and vesture and color of lvs., as also in its general habit. It is only occasionally seen in America and has been known as *S. alba,* var. *argentea, S. splendens,* Bray, and *S. regalis,* Hort. These forms, not easily distinguishable from one another, can be readily distinguished from the following species.

7. **vitéllina,** Linn. (*S. blánda,* Anderss.). YELLOW WILLOW. Becoming a very large and venerable appearing tree, the rather short trunk often 4 ft. or more in diam. It is often pollarded. The crown is deliquescent and rounded in outline. Branches yellow: lvs. silky-hairy when young, glabrous when mature, glaucous beneath, the whiteness intensified after the lvs. fall. Aments appearing with the leaves. Abundant in E. N. Amer. Mn. 8, p. 25 (erroneously as *S. alba*).—Displaying many variations, the most obvious of which are: Var. **aùrea,** Salisb. (var. *aurantìaca,* Hort.), branches golden yellow, especially just before the leaves appear in spring. Var. **Britzénsis,** Hort., bark red. These as well as other choice varieties are grafted. Var. **péndula.** S.H. 2:361, 371. Gn. 55, pp. 15, 22.

8. **Babylónica,** Linn. (*S. péndula,* Moench). NAPOLEON'S WILLOW. Fig. 2234. A tree of weeping habit, 30–40 ft. high, with long, slender, olive-green branches; buds small, acute: lvs. 2–6 in. long, attenuate at base and apex: aments appearing with the lvs., slender, the pistillate green: capsule small, 1 in. long. Caucasus. Gn. 1, p. 371; 34, p. 527; 39, p. 72; 55, p. 92. S.H. 1:261.—Long known in cultivation and often grown in cemeteries. Several forms recognized, some of which may be hybrids: Var. **aùrea,** Hort., branches golden yellow. Var. **annulàris,** Forbes, lvs. twisted back so as to form a sort of ring. Var. **doloròsa,** Rowen. WISCONSIN WEEPING WILLOW. Lvs. glaucous beneath; hardy farther north. Var. **Sálamonii,** Hort., more vigorous and upright in habit, a form originating in France. Gn. 55, p. 19. S.H. 2:373. *S. Salmonii* of one catalogue is perhaps an error for this. Var. **Japónica,** Thunb., lvs. more decidedly toothed; aments longer and looser.

9. **elegantíssima,** Koch. THURLOW'S WEEPING WILLOW. Tree with more spreading habit and larger crown than *S. Babylonica:* branches long and pendent, yellowish green, sometimes blotched with brown: appears to be more hardy than *S. Babylonica.* Japan. Gn. 55, p. 24. S.H. 2:363. *R. Sièboldii,* Hort., is this species or is closely related.

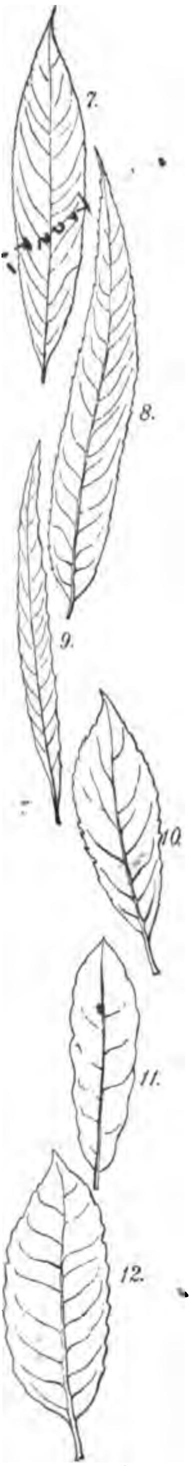
10. **intèrior,** Rowlee (*S. rùbra,* Rich, not Huds. *S. longifòlia,* Muhl., not Lam. *S. fluviátilis,* Sargent and other recent authors in part). Fig. 2234. Varying in stature from a low shrub to a small tree, usually growing along streams and lake shores: twigs smooth and brown to densely tomentose and gray: buds plano-convex, with an obtuse and rounded apex, very small: lvs. nearly or quite smooth, sparsely canescent to extremely canescent, sessile, linear-elliptical, remotely dentate, the teeth narrow, sometimes quite spinulose: stipules conspicuous, ear-shaped, obscurely denticulate, deciduous: aments of

late spring on short lateral peduncles, which bear 4–6 lvs., those borne later in the season on much longer leafy branches, very loosely fld.: fls. fascicled in clusters of 2–5 on the axis, a distinct interval between the fascicles, first appearing in May and often bearing a second set of aments in early summer; scales usually glabrous or somewhat hairy toward the base, narrowly oblong, yellowish, deciduous after flowering: filaments crisp hairy below, smooth above: capsules sessile, clothed when young with appressed silvery hairs, becoming nearly smooth at maturity: stigmas short, sessile. Central N. America.—The pistillate ament, lax at anthesis, becomes more so as the capsules mature, and by this character the species can easily be distinguished from related species.

11. **argophýlla,** Nuttall (*S. longifòlia*, var. *argophýlla*, Anderss. *S. fluviátilis*, var. *argophýlla*, Sargent. *S. Hindsiàna*, Bentham). Tree or large shrub, 12–18 ft. high, forming dense thickets but not growing in clumps: branches nearly glabrous and exceedingly tough: bark turning from brown to bright yellow or orange just before blooming, making a thicket of it a most conspicuous object: lvs. narrowly lanceolate, closely sessile, entirely or rarely minutely and remotely denticulate, clothed equally on both sides with an appressed silky pubescence, which more or less conceals the veins; stipules obsolete: scales oblong and obtuse in the staminate ament, narrower and more acute in the pistillate; lower half of the filament densely crispy hairy: capsule lanceolate, covered with straight appressed silky hairs, closely sessile: stigmas sessile; mature capsule often nearly glabrous.—Occasionally the leaves remain upon the plant over winter, the young shoots appearing in their axils in spring. Ament surpassed in length by its leafy peduncles; appearing in May in Oregon and northern California and flowering intermittently all summer. This species is distinguished by its narrowly lanceolate, entire leaves, obsolete stipules, small and rather narrow aments, erose scales and hairy capsules. *S. argophylla* occurs on the Pacific slope from southern California to British Columbia. It is a western representative of the long-leaved Willows. Not advertised, but a beautiful species common along streams and irrigation ditches.

12. **Cáprea,** Linn. GOAT WILLOW. Fig. 2235. A small tree, 12–25 ft. high, with upright branches: lvs. large, 2–5 in. long, 1–3 in. wide, rounded or subcordate at base, rugose, very variable: aments appearing before the lvs., large and showy, especially the staminate ones. Eu. Asia.—The typical form often occurs in yards where it has sprouted from the stock upon which the more popular but scarcely more ornamental variety, *pendula*, has been grafted. Var. **péndula,** Hort. KILMARNOCK WILLOW. Dwarfed form, grafted on stock about 4 ft. high, and forming a weeping shrub. Often planted in yards. *S. multinérvis* is supposed to be a hybrid, and probably belongs with *S. Caprea*. *S. Caprea*, var. *trícolor*, Hort., is said by F. W. Kelsey to be a round-headed tree, with "tricolored foliage." *S. palmæfòlia*, Hort., is said by F. W. Kelsey to be of vigorous growth, with large, deep green lvs. and reddish purple young wood.

13. **discolor,** Muhl. PUSSY WILLOW. Figs. 2228, 2229, 2234. A shrub or short-trunked tree, 10–20 ft. high: buds very large and nearly black: lvs. smooth and bright green above, whitish beneath, irregularly crenate-serrate: aments appear early in spring, before the lvs., closely sessile, enveloped in long, silky hairs. E. N. Amer.—Worthy of more extended cultivation and thriving in dry ground.



2234. Leaves of Willows (× ½).

7. *Salix alba;*
8. *Babylonica;*
9. *interior;*
10. *Bebbiana;*
11. *tristis;*
12. *discolor.*

14. **Bebbiàna,** Sarg. (*S. rostràta*, Rich.). Fig. 2234. A small tree, 10–20 ft. high, with short but distinct trunk: buds of medium size, conical, brown: lvs. dull green and downy above, prominently veined and hairy beneath: aments appearing with the lvs., the staminate beautiful golden when in flower; scales narrow and shorter than the pedicels; capsules long rostrate. E. N. Amer.—Prefers dry soil and can be used to good advantage against walls and in rockeries.

15. **hùmilis,** Marsh. PRAIRIE WILLOW. A shrub, 3–8 ft. high, varying much in stature, and in size and shape of lvs.: branches hairy: lvs. oblanceolate to oblong, nearly entire, more or less revolute: aments densely and many-fld. E. N. Amer.—Grows in driest situations.

16. **tristis,** Ait. DWARF WILLOW. Fig. 2234. A diffuse shrub, 1–1½ ft., with long deep-set root: branches gray, slender: lvs. small, 1 in. long, linear-lanceolate, very short-petioled: aments small and rather few-fld.: stamens orange-red. E. N. Amer.

17. **sericea,** Marsh. SILKY WILLOW. A shrub usually 4–8 ft. high, diffusely spreading from base: branches often reddish: buds obtuse and rounded at apex, cylindrical: lvs. very silky beneath, sometimes becoming less so at maturity: aments densely fld., appearing with the lvs.: stamens often orange-red; capsules short-pedicelled, ovate-oblong, nearly truncate at apex. Northeastern N. Amer.

18. **petiolàris,** Sm., not Hort. Fig. 2233. A low shrub, 3–5 ft. high: branches slender, the whole plant much slenderer than *S. sericea*, with which it frequently grows: buds smaller and more pointed: lvs. only slightly silky when young, soon glabrous, more evidently toothed: aments rather loosely fld.: capsules rostrate and pointed, distinctly pedicelled. Central and northeastern N. Amer.—*S. petiolaris* of the trade is *S. incana*.

19. **viminàlis,** Linn. OSIER WILLOW. A shrub or small tree, 10–20 ft. high: branches slender and straight: lvs. linear-lanceolate, beautifully silvery, 4–10 in. long; margins revolute, entire: aments appearing before the lvs., golden yellow. Eu. Asia.—Most often seen in plantations for basket material, for the production of which the plants are cut near the ground every year. Willow culture in experienced hands is often profitable. (For details, see Simpson, Osier Culture, Bull. 19, Div. of For., U. S. Dept. Agric. 1898.) This species does not thrive in this country as well as in Europe.

20. **cándida,** Fluegge. HOARY WILLOW. Fig. 2233. A shrub, 2–5 ft. high: young branches hoary, becoming smooth and red with age: buds reddish, rounded at the apex: lvs. lanceolate or linear-lanceolate, 2–4 in. long, dark green and wrinkled above, covered below with dense white tomentum, revolute: aments sessile, appearing before the lvs.; staminate of reddish capsule densely white woolly, with red style and stigmas. N. Amer.—This species hybridizes freely with *S. cordata*, and several natural hybrids have been described.

21. **myrtilloides,** Linn. Fig. 2233. A shrub, 2–5 ft. high, with rather slender brown twigs: lvs. oblong or elliptic-obovate, usually obtuse at both ends, entire and smooth, reticulate-veined: aments rather few-fld.: capsules reddish, glabrous. N. E. N. Amer. and Eu. Usually grows in cold peat bogs.—Probably not in cult. The plant sold under this name is probably some form of *S. purpurea*, which *S. myrtilloides* closely resembles in general appearance.

22. **cordàta,** Muhl. (*S. rigida,* Muhl.). HEART-LEAVED WILLOW. Fig. 2236. A large shrub or small tree, 10–30 ft. high: branches stout: buds large, flattened against the branch: lvs. oblong-lanceolate, green on both sides, finely serrate, glabrous and rather rigid at maturity: aments rather slender, appearing with the lvs.: capsules glabrous, greenish or brownish. N. Amer.—This is a variable species and undoubtedly some of the forms included in it are hybrids; several supposed natural hybrids have been described. Var. **péndula,** Hort., is a decumbent form.

2235. Staminate catkins of Goat Willow—Salix Caprea (× ½). No. 12.

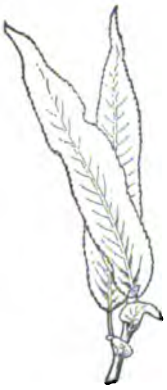
23. **irroràta,** Anders. COLORADO WILLOW. A dense diffuse shrub, 8–12 ft. high: branches stout, covered with a white bloom: buds large: lvs. linear-lanceolate, 3–4 in. long, ½ in. wide, green above, glaucous beneath, undulate serrate: aments all appearing before the lvs., sessile, very densely fld.; staminate golden yellow: capsule glabrous, nearly sessile. Rocky Mts.

24. **incàna,** Schrank. (*S. petiolàris* and *S. rosmarinifòlia* of Amer. gardeners, but not of botanists). Shrub or small round-topped tree, with long, slender branches: lvs. linear, revolute, 2–5 in. long, very narrow, green above, white-tomentose beneath: aments long and slender, appearing with the lvs.: capsule glabrous: filaments of stamens more or less connate. Eu.—This species is grafted upon hardy stock (*S. Caprea*) when sold from nurseries.

25. **purpùrea,** Linn. (*S. Forbyàna,* Sm. *Vètrix purpùrea,* Rafin.). PURPLE OSIER. Fig. 2233. A shrub or small tree, spreading at base, with long, flexible branches: lvs. oblanceolate serrulate, glabrous, veiny, 3–6 in. long, often appearing opposite: aments sessile, slender; pistillate recurved; scales purple: stamen one: capsules small, ovate. Eu.—Planted as an ornamental shrub and escaped in many places. Also grown as a basket Willow. Var. **péndula.** Branches pendent. Gng. 4:243.

26. **Sitchénsis,** Sans. SITKA WILLOW. A shrub, 10–12 ft. high and more: lvs. obovate, glabrous, clothed beneath with silky hairs which have a beautiful satiny luster: aments appearing with lvs., long, cylindrical and graceful, also satiny. This Willow, which, so far as the writer knows, has not been used as an ornamental plant, is one that would be at once novel and beautiful.—The characteristic lustre of the leaves is preserved in plants in cultivation. N.W. N. Amer.

W. W. ROWLEE.



2236. Leaves of Salix cordata, showing stipules. (× ⅛.)

SALLOW. *Salix Caprea.*

SALMON BERRY. *Rubus spectabilis.* See also *Alaska.*

SALPICHRÒA (Greek, *tube* and *skin;* in reference to the form and texture of the flower). Syn., *Salpichroma.* *Solanàceæ.* About 10 species. Natives of extra-tropical regions, mostly American herbs or shrubs. Lvs. often small, entire, long-petioled: fls. white or yellow, 2–3 in. long (section Eusalpichroa) or only about ½ in. long (section Perizoma); calyx tubular or short, 5-cleft or parted, the lobes linear; corolla tubular or urn-shaped, without a crown in the throat; lobes 5, acute, often short, induplicate-valvate: berry ovoid or oblong, 2-celled: seeds numerous, compressed.

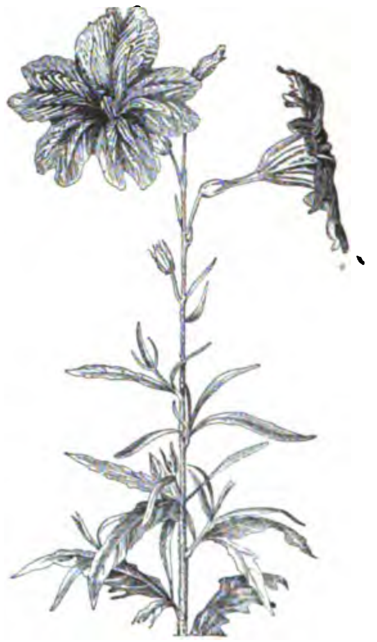
Krelage says of the species described below: "This plant is neither beautiful nor interesting, but it has the advantage of being an exceedingly rapid climber, covering walls within one season with a thick mass of foliage." Franceschi says the small white berries are sold everywhere in Paraguay as "cock's eggs."

rhomboìdea, Miers (*Salpichròma rhomboìdeum,* Miers). A half-hardy climber, somewhat woody, with green, flexuous branches: lvs. ovate-rhomboid: fls. small, usually less than ½ in. long, solitary, nodding, white; corolla short, constricted at the middle and at the throat, and bearing on the inside a fleshy, woolly ring: berry ovate-oblong, yellowish or white, edible, but of poor flavor. Argentine Republic. G.C. III. 24:450. R.H. 1897:531. Gn. 35, p. 367.—The plant appears to be offered as *Withania origanifolia.* Cult. in S. California.

F. W. BARCLAY.

SALPICHROMA. See *Salpichroa.*

SALPIGLÓSSIS (Greek, *tube* and *tongue;* alluding to the form of the corolla and the appearance of the style). *Solanàceæ.* A genus of possibly 2 or 3 species of annual or biennial plants, natives of Chile. The only species in cult. is *S. sinuata,* which was formerly divided into about 6 species mainly on the color of the flowers. *S. sinuata* has greatly improved in size of flowers and range of color until it is at the present time amongst our very finest half-hardy annuals. Plants about 18 in. high, covered with short glandular hairs: lvs. entire, wavy-margined, dentate or pinnatifid: fls. long-stemmed, large, funnel-shaped, ranging in color from various shades of purple and blue through numerous reds and yellows to creamy white, and usually



2237. Salpiglossis sinuata (× ⅓).

beautifully marbled and penciled with several colors. Calyx tubular, 5-cleft: corolla funnelform, widely bell shaped at the throat; lobes 5, plicate, emarginate: stamens 4, didynamous: capsule oblong or ovoid; valves 2-cleft.

The varieties of Salpiglossis require the general treatment given half-hardy annuals. They prefer a deep, light rich soil not given to sudden extremes of moisture and dryness. The seeds may be sown indoors by the middle of March, or later, or may be sown outdoors in early spring. Care must be taken that the early sown plants do not become stunted before being planted out. They bloom for several weeks in late summer. The flowers are useful for cutting and last well in water. The plant is also excellent as a greenhouse annual for late winter bloom. Seeds for this purpose may be sown in late summer.

sinuàta, Ruiz and Pav. (*S. variábilis*, Hort. *S. hýbrida*, Hort. *S. grandiflòra*, Hort.). Fig. 2237. 'Hardy annual, 1–2 ft. high, suberect, branched, sticky-pubescent, with fls. 2 in. long and wide, ranging from straw-color and yellow through scarlet nearly to blue, with great variation in venation, and markings: lower lvs. petiolate, elliptic-oblong, wavy-toothed or pinnately cut: upper lvs. more nearly entire: bracts sessile, entire. Vars. **azùrea, aùrea, coccínea, pùmila, nàna** are offered. V. 23:129. Gn. 29, p. 166; 40, p. 75. R.H. 1849:361. Var. **superbissima** has a more columnar manner of growth with a thick, unbranched stem. G.C. III. 22:363. A.G. 18:860.

F. W. Barclay.

SALPÍNGA (*Salpinx*, trumpet; referring to the shape of the calyx). *Melastomàceæ.* Here belongs the dwarf stove foliage plant known to the trade as *Bertolonia margaritacea.* The lvs. are large, heart-shaped, metallic green above, with lines of small white dots running from the base to the apex as do also the 5 prominent ribs; the lower surface is a dull but rich crimson. For culture, and botany of allied genera, see *Bertolonia.* Fls. 5-merous: calyx tube 10-ribbed, limb with 5 obscure or elongated lobes: stamens 10, opening by a single pore at the apex.

2238. Salsify or vegetable oyster (× ⅙).

margaritàcea, Triana. (*Bertolònia margaritàcea*, Bull. *Gravèsia guttàta*, var. *margàritacea*, Nicholson). Tender perennial herb: stem 1⅙ to 3 in. long, unbranched: fls. pedicelled, in dichotomous cymes, white or rosy white. Brazil. F.S. 16:1697.

W. M.

SALSAFY is the spelling preferred in England; Salsify in America.

SALSIFY (formerly sometimes spelled *salsafy*) is *Tragopogon porrifolius*, one of the compositæ. Fig. 2238. It is a garden esculent, being grown for the fleshy root. This root has the flavor of oysters, hence the plant is sometimes called Vegetable Oyster and Oyster Plant. Salsify is perfectly hardy. The seeds (which are really fruits) are sown in early spring, about as soon as the soil can be prepared, in drills where the plants are to stand. The drills may be 2–3 ft. apart, if tilled by light horse tools, or half that distance if tilled only by hand. In the rows, the plants are thinned to stand 2–5 in. apart. The plant requires the entire season, in the North, in which to grow. The roots may be allowed to remain in the ground until spring, for freezing does not harm them. In fact, they are usually better for being left in the ground, because they do not shrivel and become tough as they often do in storage. If they are kept cool and moist in storage, however, the quality is as good as when the roots remain in the ground. At least a part of the crop should be stored, in order that the table or the market may be supplied during winter and early spring.

2239. Plant of Russian thistle.

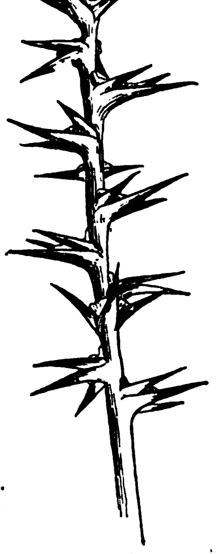
Salsify is biennial. The second spring, a strong stalk 2–3 ft. tall is sent up from the crown of the root, and in spring or early summer an abundance of light purple flower-heads are produced. The flowers, or heads, close about noon. The leaves are long linear and grass-like. The roots are small, well-grown specimens being about 1 ft. long and unbranched, and about 2 inches in diameter at the top. The skin is grayish white. Salsify is easy to grow, and it has no serious pests. It is a vegetable of secondary importance commercially, although it should be in every home garden, particularly in the North, where it thrives best. Eight to ten lbs. of seed is sown to the acre. There are few varieties, and these have no marked characteristics except in size. The Mammoth Sandwich Island and Improved French are probably the best varieties. Salsify is native to southern Europe. In some places it has escaped as a weed. See *Tragopogon.*

Black Salsify is Scorzonera; Spanish Salsify is Scolymus.

L. H. B.

SÁLSOLA KÀLI, var. **Tràgus**, is the Russian Thistle. Figs, 2239, 2240. Some of the bulletins devoted wholly or largely to this weed are Calif. 107, Col. 28, Iowa 26 and 33, New Mex. 16, Minn. 33, Ohio 55, Wis. 37, 39. See also the following publications of U. S. Dept. of Agric.: Farmer's Bulletin 10, Bulletin 15, Div. of Botany; also Essay 8, "Survival of the Unlike." In the unoccupied lands of the upper Mississippi valley, the Russian Thistle has covered great areas, and it has spread eastward along the railroads. With good tillage and short rotations of crops, little need be feared from the pest.

SALTBUSHES are plants recommended for alkali lands, belonging to the family *Chenopodiàceæ* and mostly to the genus Atriplex, which see. Used for forage in the dry regions. The introduction of the Australian Saltbush (*Atriplex semibaccata*) has been a great event in the

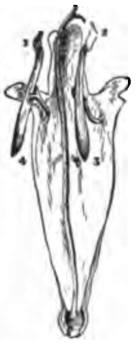

2240. Sprig of Russian thistle. Nat. size.

progress of agriculture in the arid regions. Farmers' Bulletin No. 108, U. S. Dept. of Agriculture, gives 19 pages of information about Saltbushes.

SALT-GRASS. *Distichlis.*

SALT TREE. *Halimodendron argenteum.*

SÁLVIA (Latin, *to keep safe or healthy;* referring to the medicinal properties of the common Sage). *Labiatæ.* Sage. A genus of about 650 species of herbs, subshrubs and shrubs, hardy and tender, including Sage, Clary, Scarlet Salvia and many other interesting plants. Salvia is by far the largest of the 136 genera of Labiatæ described by Bentham and Hooker, and is characterized by certain peculiarities of the stamens that are connected with the cross-pollination of the fls. by insects. It has been well said that the structure of the flower in Salvia is as complicated and specialized as in any orchid. Some idea of this structure may be gained from Fig. 2241. The bodies shown at 1 and 2 are the two fertile anthers, or rather anther cells. The points 3 and 4 indicate places where other anther cells might be expected. In some species of Salvia the points 3 and 4 are occupied by pollen-bearing anther cells; in others by sterile cells. The body connecting 1 and 4 is not the filament, but the "connective," the filament being the smaller body which joins the connective to the corolla. The extraordinary length (or rather width) of the connective is one of the main generic characters of Salvia. In ordinary flowers the connective is a mere thread, a linear extension of the filament, and barely separates the two anther cells. In Salvia the anther cells are forced apart to an exceptional distance, and in many cases 2 of the cells are obliterated or devoid of pollen.



2241. Section of a flower of Salvia splendens (× 1). Showing structure of stamens.

Within the generic limits of Salvia the variation is astonishing. The color of the fls. ranges from scarlet through purple and violet to azure-blue, white and even pale yellow, but there seems to be no good pure yellow. Fig. 2243 indicates something of the range in form of corolla and calyx. Some flowers gape wide open, others are nearly tubular. In some the upper lip is longer than the lower, in other cases the lower lip is longer than the upper. The lower lip is always 3-lobed, but frequently it does not appear to be so, for the lateral lobes are much reduced while the midlobe is greatly enlarged, often deeply lobed, and becomes the showy part of the flower. The calyx is small and green in some, large, colored and showy in others. In many cases, as *S. leucantha*, the corolla and calyx are of different colors. The bracts range from minute and deciduous to a larger size and more attractive color than the fls. There are usually about 6 fls. in a whorl, sometimes 2, sometimes many. In spite of these and many other wide variations, few attempts have been made to split up Salvia into many genera, presumably from the feeling that the structure of the stamens makes the Salvias a natural, not an artificial group.

Three Salvias are cultivated for their leaves, which are used in seasoning and also in medicine. These are the Common Sage, *S. officinalis*; Clary, *S. Sclarea*; and *S. Horminum*. For the commercial cultivation of Sage, see *Sage*.

Clary is a perennial plant, but is cultivated as an annual or biennial. The plants run to seed the second year, after which it is better to pull up the old plants. The seed may be sown in spring, in drills 12–20 in. apart or in a seed bed, from which the seedlings are pricked out in May. In August the first leaves may be gathered and the plants will continue to yield until June or July of the following year.

Clary (*S. Sclarea*) and its near relative, *Salvia Horminum*, are plants of exceptional interest. They are cultivated for their culinary and medicinal value and also for ornament, but their ornamental value lies not in the fls. (which are usually insignificant) but in the colored bracts or floral lvs. at the tops of the branches. The various varieties are known as the Purple-top Clary, Red-top Clary or White-top Clary; also Red Sage and Purple Sage. The two species (*S. Sclarea* and *Horminum*) seem to be much confused in our catalogues, but the plants may be separated by the following characters: the upper lip of the calyx is 3-toothed in *S. Sclarea*, and truncate in *Horminum*; the upper lip of the corolla is sickle-shaped and compressed in *Sclarea*, but straightish and concave in *Horminum*. According to DeCandolle both of these species have large and showy floral leaves. It is to be inferred from Voss' treatment of the two species (in Vilmorin's Blumengärtnerei) that *S. Horminum* is the species chiefly cult. for the showy floral leaves, while the name "Clary" should be restricted to *S. Sclarea*. There is another odd feature about the floral leaves of both species. The red, white or purple tops seem to be composed of sterile lvs., i. e., they do not inclose any whorls of flowers, while the large bracts under the whorls of flowers are green. However, DeCandolle refers to *S. Sclarea* two pictures in B.M. and B.R. where the situation is reversed, i. e., the showy colored parts are the bracts under the whorls of flowers and there are no sterile bracts at the top. Moreover, the flowers in the cases just cited are anything but insignificant, being fully an inch long.

Among the Salvias cultivated for ornament there are two large cultural groups, the hardy and the tender. The hardy species are mostly border plants, blooming in spring and early summer. The tender species are generally used for summer bedding, sometimes for conservatory decoration in winter. Many of them bloom in summer and late fall, especially when they are treated as half-hardy annuals.

As regards color of flowers there are also two important groups, the scarlet-flowered, and the kinds with blue, purple, violet, white or variegated flowers. Of the scarlet kinds *S. splendens* is the most called for; of the blue-flowered kinds, *S. patens* is the most popular of the bedding class, and *S. pratensis* the most popular of the hardy class. *S. patens* probably has the largest fls. of any of the blue-fld. kinds in cultivation.

The most widely used of all Salvias cultivated for ornament is *Salvia splendens*, or Scarlet Sage. This is one of the most brilliant red-flowered bedding plants in cultivation. It is generally grown in large masses. It does best in full sunshine, but may be used in shady places to light up dark woody recesses. It should have a dark background of some kind by way of contrast. A well-managed mass of Scarlet Sage may be maintained in full splendor from the middle of July to frost. It is propagated by either cuttings or seed. It is rather troublesome to keep cuttings or plants over winter, as they are particularly liable to attacks of aphis and red spider. It is, therefore, important to get seed of an early-blooming variety of compact habit, and to sow the seed early indoors or in a frame in time to get good plants to set outdoors in May. A good raceme is over a foot long, with 30 or more fls. in a raceme, and 2–6 fls. in a whorl, each flower being 2 in. or more long. Some varieties have erect racemes, others pendulous, and there are white varieties, together with some intermediate colors. A poorly managed bed of Scarlet Sage gives a few flowers in September and is cut off in a short time by frost. Wet seasons delay the bloom, and if the soil is too rich in nitrogen the plants will make too much growth and the fls. will be late and relatively few. The same principles of cultivation apply to other tender Salvias used for bedding. Florists sometimes lift a few plants of Scarlet Sage before frost, pot them and find that they make attractive plants under glass for a month or two. One advantage that *Salvia splendens* has over many other red-fld. Salvias is that its calyx is as brilliant scarlet as the corolla.

Special attention is called to the supplementary list, nearly every species of which is distinct at first sight and seems worthy of cultivation. There are many showy, bright red-flowered Salvias which seem to be not cult. in America. The following are amongst the most desirable and are described in the supplementary list.

S. Boliviana, confertiflora, elegans, gesneræfolia, leonuroides, rubescens, strictiflora.

Salvia was monographed in 1848 by Bentham in DC. Prod. vol. 12, and an index to the 407 species therein described is found in Buek's "Genera, Species et Synonyma," etc., pars iii. In 1876, Hemsley gave an account in The Garden (9:430–434) of 65 species which had been in cultivation up to that time. See also "A Synopsis of the Mexican and Central American Species of Salvia," by M. L. Fernald (Proc. Am. Acad. Arts Sci., vol. 35, 1900, and Contrib. Gray Herb. Harvard Univ. N. S. No. 19). In the work just cited 209 species are described and there is an elaborate key.

2242. Salvia splendens (× ½). No. 2.

SUMMARY OF SUBGENERA AND SECTIONS.

SUBGENUS I. SALVIA PROPER. *Corolla with a hairy ring inside: anterior portion of the connective directed outwards, bearing an anther cell which is rarely pollen-bearing. All Old World species.*

Section 1. Eùsphace. Shrubs or subshrubs, rarely herbs. Teeth of the calyx scarcely enlarged in fruit: posterior lip of the corolla erect, straightish, concave. Includes **officinalis.**

Section 2. Hymenósphace. Like Section 1, but the lobes of the calyx enlarged in fruit, membranaceous and veiny: posterior lip of the corolla straight in the oriental species, sickle-shaped in the South African. No species cult. in America.

Section 3. Drymósphace. Herbs, usually tall and glutinous: teeth of calyx scarcely enlarged in fruit: posterior lip of the corolla falcate, compressed. Includes **hians.**

SUBGENUS II. SCLAREA. *Corolla with no hairy ring inside: anterior portion of the connective deflexed, abruptly dilated, connected at the callous extremity. All Old World, herbaceous species.*

Section 4. Horminum. Posterior lip of calyx truncate, the teeth small and remote: posterior lip of corolla straight, concave. Includes **Horminum.**

Section 5. Æthiópsis. Posterior lip of calyx 3-toothed: posterior lip of corolla falcate, compressed. Includes **argentea** and **Sclarea.**

Section 6. Plethiósphace. Calyx ovoid (instead of bell-shaped or tubular, as in the two preceding sections): posterior lip of calyx concave, 2-grooved, teeth 3, very short and connivent: posterior lip of corolla straight or falcate, concave or compressed. Includes **bicolor, pratensis** and **sylvestris.**

SUBGENUS III. CALOSPHACE. *Corolla with no hairy ring inside but sometimes with 2 teeth near the base: anterior portion of the connective deflexed, linear, longitudinally connate or closely approximate, often somewhat dilated, rarely bearing an abortive anther cell. All American species.*

Section 7. Calósphace. By far the largest section, characterized as above, and within these limits, immensely variable. Over 250 species, including **azurea, cacaliæfolia, coccinea, farinacea, fulgens, involucrata, lanceolata, leucantha, patens, Sessei** and **splendens.**

SUBGENUS IV. LEONIA. *Corolla with a hairy ring inside: anterior portion of connective sometimes directed outward and bearing either a fertile or sterile anther cell, sometimes deflexed and acute, rarely reduced to a short tooth.*

Section 8. Echinósphace. Bracts imbricated, spinescent: posterior lip of calyx 3-toothed: connective bearing a perfect anther cell on the posterior side. Includes **carduacea.**

Section 9. Pycnósphace. Bracts imbricated, not spinescent. Otherwise as stated in Section 8. Includes **Columbariæ.**

Section 10. Heterósphace. Bracts deciduous: posterior lip of calyx truncate: connective bearing a perfect anther cell on posterior side. Includes **lyrata.**

Section 11. Notiósphace. Bracts small or minute: posterior lip of corolla entire or with 3 minute connivent teeth. Includes no species cult. in America.

Section 12. Hemisphace. Bracts small: posterior lip of calyx 3-toothed: connective somewhat continuous with the filament and produced into a very short tooth. Includes **verticillata.**

INDEX.

alba, 15, 24, 27.
albiflora, 10, 24.
argentea, 18.
atroviolacea, 24.
aurea, 10.
azurea, 22.
Bethelli, 20.
bicolor, 19.
Bluebeard, 15.
Bruanti, 2.
cacaliæfolia, 28.
carduacea, 8.
coccinea, 5.
Columbariæ, 9.
compacta, 2.
crispa, 10.
Deschampsiana, 20.
farinacea, 16.
fulgens, 4.
grandiflora, 2, 22.
Greggii, 1.
hians, 13.
Horminum, 15.
Hoveyi, 21.
ianthina, 21.
icterina, 10.
Issanchou, 2.
involucrata, 20.
lactea, 5.
lanceolata, 26.
latifolia, 10.
leucantha, 17.
lyrata, 12.
Milleri, 10.
officinalis, 10.
patens, 27.
Pitcheri, 22.
porphyrantha, 6.
porphyrata, 6.
pratensis, 24.
Pseudococcinea, 5.
purpurascens, 10.
Rœmeriana, 6.
Rœzli, 7.
rubicunda, 24.
rubra, 15.
rutilans, 3.
salicifolia, 10.
Sclarea, 14.
Sessei, 7.
Soucheti, 2.
spelmina, 25.
Spielmanni, 25.
splendens, 2.
sturnina, 10.
sylvestris, 23.
tenuior, 10.
tricolor, 10.
variegata, 24.
Verbenaca, 25.
verticillata, 11.
violacea, 15.
vulgaris, 15.

KEY TO SPECIES.

(Based on garden characters.)

A. *Color of corolla vivid red, without a trace of purple.*
B. *Tube of corolla neutral colored: lower lip showy*.................. 1. **Greggii**
BB. *Tube of corolla as bright as the lips.*
C. *Upper lip conspicuously longer than the lower.*
D. *Base of lvs. not cordate.*
E. *Calyx vivid red*............ 2. **splendens**
EE. *Calyx green*............... 3. **rutilans**
DD. *Base of lvs. cordate*.......... 4. **fulgens**
CC. *Upper lip much or little shorter.*
D. *Base of lvs. cordate: bracts usually found at base of whorls.*
E. *Lower lip twice as long as upper*.................... 5. **coccinea**
EE. *Lower lip a trifle longer than upper*............. 6. **Rœmeriana**
DD. *Base of lvs. not cordate: bracts minute, deciduous*.......... 7. **Sessei**
AA. *Color of corolla blue, violet, purple or white.*
B. *Corolla with a hairy ring inside.*
C. *Foliage thistle-like, prickly: fls. fringed*.................... 8. **carduacea**
CC. *Foliage not thistle-like: fls. not fringed.*
D. *Length of corolla scarcely greater than that of calyx*... 9. **Columbariæ**
DD. *Length of corolla conspicuously greater than that of calyx.*
E. *Whorls 10–40-fld.*
F. *Lvs. entire*..............10. **officinalis**
FF. *Lvs. lyrate*..............11. **verticillata**
EE. *Whorls about 6-fld.*
F. *Lvs. lyrate*..............12. **lyrata**
FF. *Lvs. sagittate*............13. **hians**
BB. *Corolla without a hairy ring inside.*
C. *Branches often topped with showy-colored floral lvs.*
D. *Upper lip of calyx 3-toothed: upper lip of corolla falcate, compressed*..................14. **Sclarea**
DD. *Upper lip of calyx truncate: upper lip of corolla straightish, concave*................15. **Horminum**
CC. *Branches not topped with showy-colored floral lvs.*
D. *Whorls many-fld. (about 16)* .16. **farinacea**
DD. *Whorls about 6-fld. (in Nos. 18 and 23 sometimes 10-fld.).*
E. *Color of calyx purple, of corolla white*............17. **leucantha**
EE. *Color of calyx and corolla not as in* E.
F. *Upper lip of corolla different in color from lower.*
G. *The upper lip white*...18. **argentea**
GG. *The upper lip blue*.....19. **bicolor**
FF. *Upper lip of corolla not different in color from lower.*
G. *Fls. bright purplish red*...................20. **involucrata**
GG. *Fls. not bright purplish red.*
H. *Calyx purple*........21. **ianthina**
HH. *Calyx green.*
I. *Bracts awl-shaped* .22. **azurea**
II. *Bracts ovate or wider.*
J. *Stem panicled above*...........23. **sylvestris**
JJ. *Stem sparingly branched.*
K. *Root often tuberous*............24. **pratensis**
KK. *Root not tuberous*............25. **Verbenaca**
DDD. *Whorls about 2-fld.*
E. *Duration annual*..........26. **lanceolata**
EE. *Duration perennial.*
F. *Lvs. entire*..............27. **patens**
FF. *Lvs. crenate*.............28. **cacaliæfolia**

1. **Gréggii**, Gray. Readily distinguished from the common red-fld. kinds by the fact that only the lower lip is showy. This is carmine, and the rest of the corolla dull purplish. The foliage also makes it highly distinct. Though a native of Texas and Mexico it is offered by several dealers in hardy border plants. John Saul considered it "nearly hardy" at Washington, D.C. Shrub, 3 ft. high: lvs. linear-oblong, obtuse, narrowed at base: racemes 2–3 in. long, 6–8-fld.: upper lip short; lower lip with the large middle lobe 2-lobed and 2 small, roundish lateral lobes. B.M. 6812.—Section 7.

2. **spléndens**, Ker-Gawl. SCARLET SAGE. Figs. 2241, 2242. The most popular of all red-fld. Salvias. Tender perennial herb from Brazil, 2–3 ft. high, with scarlet fls. 2 in. or more long, borne in terminal pyramidal racemes 6 in. or more long, with 2–6 fls. in a whorl and 30 or more fls. in a raceme. Lvs. ovate, acuminate, serrate: calyx scarlet, large, loose, plaited; corolla tubular; upper lip undivided; lower lip 3-lobed, the lateral lobes much narrower and reflexed. B.R. 8:687.—Var. **Bruánti**, Hort., int. before 1880, was an improvement over previous forms in having dwarfer and more compact habit, with brighter and more numerous flowers. G.C. II. 14:781; III. 6:653. Gn. 21:336 (good picture). A.F. 5:331. Other trade names are vars. **compácta, compácta erécta, grandiflòra, grandiflòra erécta** and **grandiflòra péndula.** Also a form with golden foliage is cult. and one or more spotted with yellow. *S. grandiflòra* and *nàna* are true botanical species which are probably nowhere in cult., and these names in the trade mostly refer to varieties of *S. splendens*. Var. **Souchéti**, Planch. (*S. Souchéti*, Hort.), introduced about 1856, was considered to differ from the type in having more compact habit and fls. more numerous, more erect and more brilliant. F.S. 11:1154. The prevalent idea that this name is referable to *S. Rœzli* is probably due to a hasty reading of F.S. 14, p. 32. A white-fld. form is known to the trade as *S. Soucheti alba*. For *S. Hoveyi*, consult *S. ianthina*. Var. **Issánchou**, Hort., has rosy white corolla, calices veined red, and red anthers. I.H. 28:432 (as *S. Brasiliénsis*, var. *Issanchou*), where the calyx is bright yellow, striped red. Gn. 21:336. There are about a dozen varieties with personal names. Section 7.

3. **rùtilans**, Carr. A plant of unknown habitat which is probably a horticultural form of *S. splendens*, differing in having a small green calyx, whorls nearly always 2-fld., and inflorescence axillary as well as terminal and panicled instead of merely racemose. R.H. 1873:250.—The plant figured in G.C. II. 15:117 as *S. rutilans* has an unbranched raceme, with 6-fld. whorls and small calyx. Offered as late as 1893 by John Saul.

4. **fúlgens**, Cav. CARDINAL SALVIA. MEXICAN RED SALVIA. Differs from *S. splendens* in the darker red of the fls., the cordate lvs., and the calyx, which is dull colored and conspicuously striate but hardly "colored"; also the 3 lobes of the lower lip seem to be all about the same size and lying in the same plane instead of having the lateral ones reflexed. Mexican shrub or herb, 3 ft. high: lvs. ovate, cordate, somewhat acute, not acuminate. B.R. 16:1356.—This name seems not to be advertised in America to-day, but in 1886 Gray stated that *S. splendens* and *S. fulgens* were the two common red-fld. kinds in cult. Section 7.

5. **coccínea**, Linn. This name is said to be loosely used in trade catalogues for *S. splendens*, and it is doubtful whether the true *S. coccinea* is in cult. Perennial or annual, 2 ft. high: lvs. cordate: fls. deep scarlet, 1 in. or less long; calyx slightly reddish, lower lip twice as long as upper, the middle lobe very large and 2-lobed. Trop. America; also S. C. to Fla. and Tex. Var. **láctea**, Hort., is advertised. Section 7.

Var. **Pseudo-coccínea**, Gray (*S. Pseudo-coccinea*, Jacq.), is a tall variety which is hirsute on stem and petioles, instead of glabrate. B.M. 2864.

6. **Rœmeriàna**, Scheele (*S. porphyrántha*, Decaisne. *S. porphyràta*, Hook.). Perennial, 1–2 ft. high: lvs. cor-

date: fls. scarlet, 1 in. or more long; calyx purplish or reddish towards tips; lower lip a trifle longer than the upper, the middle lobe large and 2-cleft. Tex., Mex. R. H. 1854:301. B.M. 4939. F.S. 11:1080. — Considered hardy by Thorburn. Section 10.

7. **Séssei**, Benth. (*S. Rœzlii*, Scheidw.). Fig. 2243. Remarkable for its large fls. (2 in. long), with boldly deflexed lower lip, which is not 3-lobed but merely 2-cut at apex; also remarkable for the large, loose calyx, flushed with brick-red towards apex. Mexican subshrub: lvs. ovate, serrate, not cordate. F.S. 14:1407.

8. **carduàcea**, Benth. Fig. 2243. Unique among Salvias for its thistle-like foliage and fringed fls. The lvs. and the large conspicuous bracts are very prickly and the lilac-colored fls. much cut, the fringes of the lower lip being more numerous and deeper. Tender perennial from Calif., 1-1½ ft. high, very woolly: lvs. all radical, densely woolly beneath. B. M. 4874. G. C. II. 19:56. — Offered by Calif. collectors and lately by eastern seedsmen. Section 8.

9. **Columbàriæ**, Benth. A common Californian annual hardly worth cult. for ornament, the blue fls. being about ⅛ in. across and not as long as the bracts. Height 9 in.–2 ft.: lvs. few, wrinkled, radical ones long-stalked, oblong, pinnatifid or bipinnatifid; divisions obtuse. B.M. 6595 (fls. lilac). — Offered by Orcutt.

10. **officinàlis**, Linn. SAGE. Woolly white, south European subshrub, varying greatly in breadth and woolliness of lvs.: fls. purple, blue or white, large or small: whorls few, dense, 10–20-fld. — The form commonly cultivated as a kitchen herb is var. **tenùior**, Alef., with blue fls. and lvs. 3–4 times as long as broad. Other forms are: var. **albiflòra**, Alef., with white fls. and lvs. 3–4 times as long as broad; var. **salicifòlia**, Alef., with lvs. 4–7 times as long as broad; var. **latifòlia**, Alef., with lvs. twice as long as broad; var. **crispa**, Alef., with crisped and variegated foliage; var. **sturnina**, Alef., lvs. green and white; var. **icterina**, Alef., lvs. green and gold; var. **purpuráscens**, Alef., with somewhat reddish foliage which is said to have the strongest and pleasantest taste, and is preferred in England for kitchen use; var. **Milleri**, Alef., with lvs. somewhat red and spotted; var. **àurea**, Hort., with golden yellow foliage and compact habit; var. **tricolor**, Vilmorin (*S. tricolor*, Hort., not Lem.), with lvs. of three colors, gray-green, yellowish white and pink, becoming rosy or deep red. Section 1.

11. **verticillàta**, Linn. Perennial herb from southern Europe and western Asia, with lvs. like a dandelion: lvs. lyrate, cordate at base, apical lobe largest, ovate-rotund: whorls globose, 20–40-fld.: fls. blue; corollas twice as long as calyx. — Section 12.

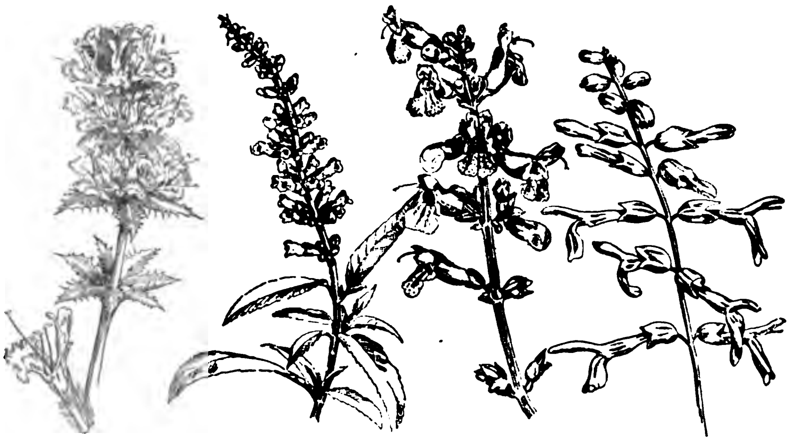
12. **lyràta**, Linn. Hardy perennial herb, with somewhat tuberous root and scape-like stems: fls. 1 in. long, blue or violet. N. J. to Ill., south Fla. to Tex. — Once offered by Bassett, of Hammonton, N. J. Section 10.

13. **hians**, Royle. Fig. 2243. Handsome hardy perennial herb from the Himalayas, with large blue or purple fls., the lower lip often white, prettily speckled with blue or purple: plant villous, 2–3 ft. high: lvs. 3–5 in. long, deltoid-ovate, base truncate or hastate; petiole 4–8 in. long: raceme 8–12 in. long: fls. 1–1½ in. long; upper lip 2-lobed, lower lip with large obcordate midlobe and broad revolute side lobes. B.M. 6517. B.R. 27:39. R.H. 1845:145. — Section 3.

14. **Sclàrea**, Linn. CLARY. Biennial (according to DeCandolle): lvs. broadly ovate, cordate at the base, the largest 8–9 in. long, 4–5 in. wide: fls. pale purple or bluish. Discussed above. B.R. 12:1003 (*S. Simsiana*). B.M. 2320 (as *S. bracteata*). — Bracts pink: fls. blue, with a white under lip in both plates. Section 5.

15. **Horminum**, Linn. Annual: lvs. oval-oblong, rounded or wedge-shaped at the base: fls. reddish violet. Discussed above. Voss calls the varieties with colored floral lvs.: vars. **vulgàris**, light violet; **violàcea** (*S. Bluebeard*, Hort.), light violet-blue; **rùbra** and **álba**. — Section 4.

16. **farinàcea**, Benth. Figs. 2244, 2245. Charming and popular plant, with violet or purple corollas set off by the light blue mealy calyx. Botanically close to *S. azurea* but easily distinguished by color of fls. Perennial herb, 2–3 ft. high: lower lvs. ovate-lanceolate, coarsely and irregularly serrate; upper lvs. lanceolate or narrower. R.H. 1873:90. Gn. 9:19; 28, p. 59. — Although a native of Texas, it is offered by several dealers in hardy herbaceous perennials. It is also treated as a hardy annual. Section 7.



2243. Types of Salvia. (All × ⅓.)

At the left, *S. carduacea;* unique for its fringed flowers. Next is *S. leucantha*, example of kinds in which the flower does not gape widely. The two at the right, *S. hians* and *Sessei*, are interesting for the size and lobing of the middle lobe of the lower lip.

17. **leucántha**, Cav. Fig. 2243. Delightful Mexican shrub, with white club-shaped fls. (not widely gaping) set off by purple calices. Branches covered with white wool, which is at length deciduous: lvs. lanceolate, serrate: fls. 1 in. long; calyx densely lanate. According to DeCandolle the whorls are many-fld., but in B.M. 4318, F.S. 22:2318, and Gn. 21:336 they are mostly 6-fld. — Section 7.

18. **argéntea**, Linn. Biennial, 2–4 ft. high, viscid: lower lvs. 6–8 in. long, oblong, crenate, rugose: inflorescence a panicle 2–2½ ft. long, usually composed of 3 branches: whorls distant, about 6-fld.: fls. whitish, purplish pubescent above; upper lip or galea much longer than the lower. Mediterranean region. F.C. 3:112. — Seems to be considered a hardy perennial by American seedsmen. It is worth cultivating for the woolly white foliage alone. Section 5.

19. **bicolor**, Lam. Hardy biennial, spring-blooming plant, with large blue fls., the lower lip white at first, but said to fade quickly to a rusty brown: lvs. all cordate at base and sticky-pubescent; lower ones ovate, incised and dentate; upper ones lanceolate: upper lip of corolla hooded, lower lip 3-lobed. N. Africa, Spain. B.M. 1774. G.M. 40:487. — Section 6.

20. **involucràta**, Cav. This has just enough purple in its fls. to exclude it from the scarlet-fld. section, but it has a very brilliant color and distinct form of flower. The corolla is swollen in the middle, constricted at the throat and not wide-gaping. The species is also remarkable for the large, showy, rosy purple, deciduous bracts. Lvs. long-stalked, ovate, acuminate, serrate, rounded-wedge-shaped at the base: inflorescence dense. B.M. 2872. B.R. 14:1205. R.H. 1858, p. 239. — Var.

Deschampsiàna, Verlot, has brighter colored corolla and calices. R.H. 1869:130. Var. **Béthelli** (*S. Béthelli*, Hort.) is a horticultural form of more compact habit and fls. described as rosy crimson or puce. Gn. 21:336.—Section 7.

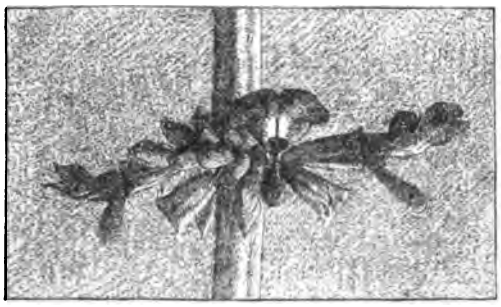
2244. Habit of Salvia farinacea. No. 16.
From a mass 2 ft. high.

21. **ianthina**, Otto & Dietr. (*S. Hóveyi*, Hort.). Tender herb, doubtless perennial, with the habit of *S. splendens*, but the fls. purple-violet, the calices colored still deeper. Supposed to be native to Mex. or Peru. F.S. 9:884. R.H. 1854:61.—*S. ianthina* is not advertised, but *S. Hoveyi*, said to be a sport from *S. splendens* originating with C. M. Hovey, is probably synonymous with *S. ianthiana*. G.C. II. 15:145.—Section 7.

22. **azùrea**, Lam. Blue-fld. perennial, 1–5 ft. high: lower lvs. lanceolate, serrate; upper lvs. narrower, often linear, entire: fls. blue, varying to white. B.M. 1728. S. C. to Fla. and Tex., varying insensibly into the western.

Var. **grandiflòra**, Benth. (*S. Pitcheri*, Torr.), which differs in being cinereous-puberulent: inflorescence denser: calyx tomentulose-sericeous rather than minutely puberulent. This is found from Miss. and Tex. to Kans. and Colo., and in its hardy form is a delightful plant. Here probably belongs *S. Pitcheri*, var. *angustifolia*, once offered by John Saul. Gn. 19:288. G.C. II. 14:685.—According to Woolson the plant usually sent out by nurserymen on both sides of the Atlantic for *S. Pitcheri* is *S. farinacea*. Section 7.

23. **sylvéstris**, Linn. Hardy perennial herb, with purple-violet fls.: lower lvs. petioled, upper ones sessile, all oblong-lanceolate, rounded or cordate at base: whorls 6–10-fld.: corollas twice as long as calyx. Eu., N. Asia.—Section 6.



2245. Flowers of Salvia farinacea. Natural size.

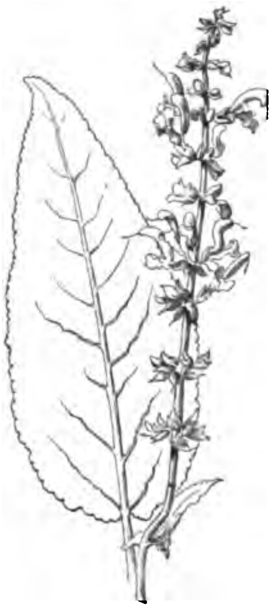
24. **praténsis**, Linn. Fig. 2246 The most popular hardy blue-fld. Salvia. Perennial herb, sometimes tuberous-rooted, the fls. normally blue, with reddish and white varieties. The lvs., especially in the southern varieties, are said to be more or less spotted red: lower lvs. petiolate, oblong-ovate, crenate or incised, cordate at base, glabrous above, pubescent beneath along the petioles and nerves; stem-lvs. few, sessile: uppermost lanceolate bracts shorter than the calyx, reflexed, cordate-ovate: whorls 6-fld.: fls. about 1 in. long, blue; calyx sticky-villous; corolla thrice as long as calyx.—Var. **rubicúnda** (*S. rubicúnda*, Wender.) is a name which may be used for the reddish-fld. form cult. in America. Var. **álba**, Hort., has white flowers. The following forms are given by Voss, and are probably procurable from Germany: Vars. **atroviolàcea, albiflòra,** and **variegàta**; the last has pale blue fls., with the midlobe of the lower lip white.

25. **Verbenàca**, Linn. (*S. Spièlmanni*, Willd.). Hardy perennial herb with blue, rarely whitish fls. Here probably belongs *S. spelmina* of the American trade, which is presumably an error for *S. Spielmanni*. Lvs. ovate or oblong, lower ones petiolate, narrowed at base, upper ones broader, sessile and cordate at base: corolla about half as long again as the calyx. Eu., Orient.

26. **lanceolàta**, Brouss. A plant has been cult. under this name in American nurseries, but it is believed to be a hardy perennial, and is probably some common species. The true *S. lanceolata* is an annual with blue or purplish flowers about ⅓ in. long. Prairies, Neb. to Tex., Ariz. and Mex.; also E. Fla.

27. **pàtens**, Cav. The most popular tender blue-fld. Salvia. Perennial herb: stem pilose, 1–2 ft. high: lvs. petiolate, ovate-deltoid, crenate, hastate at the base or the uppermost lvs. rounded at the base, hispid on both sides: bracts lanceolate-linear, spreading, few, remote: whorls 2-fld.: fls. 2 in. long or more, blue; calyx villous. Mts. of Mex. B.M. 3808. B. 3:109. F. 1840:222. Var. **álba**, Hort., is advertised in Europe. Section 7.

28. **cacaliæfòlia**, Benth. Tender blue-fld. perennial herb with triangular, mostly basal lvs. and glutinous-villous blossoms, which are swollen at the throat; lvs. undulate, villous beneath: inflorescence generally a panicle of 1 central and 2 lateral racemes: whorls 2-fld. Mex. B.M. 5274. F.S. 22:2318. Gn. 21:336.—Section 7.



2246. Salvia pratensis (× ¼).

S. acumináta, Ruiz & Pav. Peruvian blue-fld. subshrub, the lower lip of corolla white toward the base. R.H. 1843:493.—*S. amœna*, Sims, is a synonym of S. lamiifolia.—*S. angustifòlia*, Cav. Mexican blue-fld. perennial herb, the lower lip longer than the upper and more or less white towards the base. B.R. 18:1554. Section 7.—*S. asperàta*, Falc. Himalayan plant, with yellowish white fls. and very large bracts which are lined with greenish white. B.M. 4884. Section 5.—*S. aùrea*, Linn. Very remarkable South African shrub, with large bronzy yellow fls. Lvs. white-woolly, petioled, ovate or roundish: calyx exceptionally large and leafy, loose, bell-shaped and blunt. B.M. 182. G.C. II. 26:745.—*S. Austriaca*, Linn. A perennial from southeastern Eu., with yellowish fls., the upper lip spotted red. B.R. 12:1019. Section 6.—*S. Boliviàna*, Planch. One of the most desirable Salvias not cult. in America. It is a splendid red-fld. subshrub found in the Bolivian Andes at 10,000–12,000 ft., and has a remarkably dense raceme of tubular fls., each 2 in. or more long. It is close to S. rutilans, but, as Hooker says, "the panicles of S. Boliviana are much denser-flowered, the calices larger, with longer lips, and the corolla twice as long and straighter, with a smaller lower lip." B.M. 6714. F.S. 11:1148. Section 7.—*S. Candelàbrum*, Boiss., is remarkable from the fact that the fls. are dull and pale except for the large purple underlip. Mexican subshrub, found 2,500–

3,000 ft. above sea. B.M. 5017. Gn. 27, p. 113. Section 1.—*S. ceratophýlla*, Linn., is a yellow-fld. biennial from Asia Minor, remarkable for its bipinnatifid foliage. The fls. are less than 1 in. long. but they perhaps represent the nearest approach to a good yellow that Salvia affords. F.C. 1:5. Section 5.—*S. chamædrioìdes*, Cav., is a blue-fld. Mexican subshrub, the lower lip longer than the upper and the fls. marked with white on both lips toward the throat. Also found in Mex. B.M. 808. Section 7.—*S. confertiflòra*, Pohl, is a unique and most desirable species. The raceme is extremely long (2 ft.), with about 2 dozen distant whorls of fls.: whorls many-fld.: fls. small, club-shaped, not widely gaping, white at base, bright, soft red at apex. A charming subshrub, found in the Organ Mts. in Brazil. B.M. 3899. Section 7.—*S. dichròa*, Hook., is perhaps a botanical var. of S. bicolor. Its fls. are blue, except the midlobe of the lower lip, which is white. It is a native of the Atlas Mts. in Morocco, probably a tender perennial herb. Root-lvs. oblong, acute at base, while those of S. bicolor are deeply cordate. B.M. 6004. Section 6.—*S. élegans*, Vahl. Red-fld. Mexican herb, slender, 2–4 ft. high: whorls 6-fld.: fls. scarlet. more than 1 in. long. B.M. 6448 (fls. purplish crimson). Section 7.—*S. eriocàlyx*, Bertero, is a shrub found in Jamaica belonging to a group remarkable for their densely woolly calices, It is figured in R.H. 1844:1 with white corollas and purple calices. Section 7.—*S. Forskòhlei*, Linn., is a hardy perennial from Asia Minor. If it is worth cultivating it is for the novelty of the variegated fls., which are curiously marked with violet, blue and white, the filaments red and the anthers blue. B.M. 988. Section 3.—*S. gesneræflòra*, Lindl. & Paxt., is a red-fld. Colombian subshrub, that should be in cult. The fls. are large, brilliant, of very uncommon shape, being swollen at the middle and constricted at the throat; the lower hangs down and is barely 2-cut at apex. I.H. 1:32. F.S. 20:2131. F. 1851:145.—*S. Gordoniàna*, a trade name in America, seems unknown to botanists. Possibly a form of some common species. —*S. Gràhami*, Benth. The showiest part of the fl. in this species is the midlobe of the lower lip, which is large and obcordate. Mexican subshrub, which bears deep crimson and purple fls. at the same time, the latter being the older ones. The species is also remarkable for 2 small white spots, one on each half of the midlobe of the lower lip. B.R. 16:1370. Section 7.—*S. Heèrii*, Regel. Peruvian subshrub, 3–5 ft. high, with scarlet fls., lately offered in S. Calif., and formerly by John Saul, of Washington, D. C. Lvs. petioled, ovate-lanceolate, acuminate, cordate at base, toothed, pale green above, whitish below, 4 in. long, 1 in. wide: whorls 2-fld.: fls. ¾ in. long or more, later striped white; corolla not hairy inside. Probably Section 7.—*S. Hispánica*, Linn., is included in many modern works, but is probably not worth cultivating. It is an annual with small blue fls. scarcely longer than the calyx. Trop. Amer. B.R. 5:359. S. Hispanica of some authors, a native of Spain and Italy, is S. officinalis. Section 7.—*S. Indica*, Linn., is said by the Flora of British India to be a native of Syria, not of India. It is a hardy perennial with variegated fls.; upper lip violet; lower lip shorter, white, speckled with violet and bordered with yellow. B.M. 395.—*S. interrúpta*, Schousb. Hardy subshrub from Morocco, with pinnatisect foliage and large, white-throated fls. which are described in B.M. 5860 as dark violet-purple, but shown as blue in the plate. Section 2.—*S. lamiifòlia*, Jacq. (S. amœna, Sims). Blue- or violet-fld. West Indian shrub, 6–8 ft. high. B.M. 1294. B.R. 6:446. L.B.C. 4:377. Section 7.—*S. lavenduloìdes*, HBK. (S. lavenduliformis, Neumann), is an azure-blue-fld. Mexican perennial herb: whorls about 10-fld. Very attractive. R.H. 1845:445. Section 7.—*S. leonuroìdes*, Gloxin. (S. formosa, L'Hérit.), belongs to a small group of scarlet-fld. shrubs from Peru and Brazil, which are remarkable for their axillary inflorescence. Upper lip red-hairy. Peru. B.M. 376. Section 7.—*S. longiflòra*, Ruiz & Pav., has probably the longest fls. of the genus. It is a Peruvian shrub, with nodding racemes of red fls., each 4–5 in. long. Section 7.—*S. macrostàchya*, HBK., is a shrubby plant, found in Ecuador and Colombia at 10,000 feet. It grows 6 ft. high and has large pale blue fls. which are overshadowed by the too conspicuous green, persistent bracts. B.M. 7372. Section 7.—*S. marmoràta* Hort., is said to be "white, striped scarlet," doubtless referring to the fls. Presumably a variety of S. splendens. —*S. nigréscens* was advertised by John Saul about 1893 and seems unknown to botanists. Possibly a form of some common species. "Fls. blackish violet; calyx lavender."—*S. nùtans*, Linn., is given in many modern works, but is scarcely worth cult. unless for the unusual circumstance that the inflorescence is nodding. The fls. are violet and less than ½ in. long. Hardy perennial herb from western Eu. B.M. 2436. Section 6.—*S. rhombifòlia*, Ruiz & Pav. Peruvian blue-fld. annual, the lower lip larger and lined with white at the throat. B.R. 17:1429 (as S. foliosa, Benth.).—*S. rubéscens*, HBK. Charming shrub from Andes of Ecuador, with brilliant red corollas set off by purple calices. Inflorescence panicled: fls. tubular, 1 in. long, lower lip larger. B.M. 5947. Section 7. Very desirable. —*S. scabiosæfòlia*, Lam. (S. Habliziana, Willd.). One of the most attractive white-fld. Salvias, and said to be hardy. Perennial herb form Tauria, with large white fls. more or less speckled with pink. B.M. 1429 and 5209. Section 1.—*S. scapifórmis*, Hance. The habit of this plant is all but unique and singularly attractive. It has the alpine habit, lvs. all radical and the slender leafless scapes rising 6–10 in., with a dozen or more 6-fld. distant whorls of small amethystine flowers. Formosa. B.M. 6980. Section 11.—*S. Schímperi*, Benth., has white fls. 2 in. long and is one of the few desirable plants from Abyssinia. It is a mountain plant, presumably a tender perennial herb, with prominent bracts which are white, bordered green. B.M. 6300. Section 5.—*S. strictiflòra*, Hook., is exceptionally interesting by reason of its stiffly erect, tubular fls., the lower lip being not at all reflexed. Red-fld. Peruvian shrub. B.M. 3135. Section 7.—*S. taraxicifòlia*, Cosson & Bal. Morocco subshrub, with variegated fls. and lower lvs. like those of a dandelion. Fls. purple, with a yellow stripe on each half of the midlobe of the lower lip near the throat. B.M. 5991. Grows at 2,000–3,000 ft., but presumably tender north. Section 1.—*S. trícolor*, Lem. not Hort., has white fls. tipped with purple on the upper lip, and beautifully suffused with red at the apex of the midlobe of the lower lip. I.H.4:120. F.S.12:1237. Section 7.

W. M.

SALVÌNIA (Antonio Maria Salvini, 1633–1729, Italian scientist). *Marsiliàceæ*. Salvinia is an interesting plant for the small home aquarium. It is a floating plant with slender stems bearing 2-ranked, oblong lvs. 4–6 lines or even 1 in. long. The upper surface of the lvs. is covered with papillæ or minute warts; the lower is densely matted with brown, pellucid hairs. The plant is supposed to have no true roots. What look like roots are believed to be finely dissected leaves. Many aquatic plants have these two types of foliage, e. g., the Water Buttercup, *Ranunculus aquatilis*.

The plant is of easy culture in summer, but many persons have lost it over winter by not understanding its habits. It is an annual and often dies in the winter after ripening a crop of spores. Get a broad pan, fill it half full of loam and then fill the pan with water. After the water has cleared place the Salvinias on the surface. In the winter watch for the formation of the spore capsules. These grow in masses near the top of the clusters of root-like leaves. After the plants die the spore capsules will remain in the soil. The plant often passes the winter in greenhouses in a growing condition, producing no spores.

Salvinia is not a flowering plant. It is a cryptogam and has two kinds of spores, large ones and minute ones. The "spore capsules" mentioned above are technically sporocarps. Of each cluster of sporocarps, 1 or 2 contain 10 or more sessile macrosporangia, each of which contains a solitary macrospore. The other sporocarps in the cluster contain numerous pedicelled microsporangia, each of which contains numerous microspores. For a fuller and illustrated description see Britton and Brown's Illustrated Flora.

Salvinia is variously estimated to have 1–13 species. Aquatic plants are noted for their wide geographical range. The variations incident to wide range are not considered worthy the rank of species by many botanists. *Salvínia natans*, Linn., is the common European and Asian species and possibly the only one. *S. Braziliensis* is another trade name. Its lvs. are said to have a "delicate hairy surface." W. M.

SAMBÙCUS (old Latin name of the Elder, perhaps derived from Greek *sambuke*, a musical instrument said to be made of Elder wood). *Caprifoliàceæ*. ELDER. About 20 species of trees or shrubs (rarely perennial herbs) with opposite, pinnate lvs., lfts. serrate or laciniate, and numerous small white fls. in compound cymes: fr. a juicy drupe or berry, red, black, white or green. A valuable genus for the planter, of which the golden forms are too much used and the American species, *S. Canadensis* and *pubens*, too little. Either massed or single they are very effective. A hint for the effective use of *S. Canadensis* and *pubens* may be had from natural plantations when the two species are intermingled, the white flowers of the former contrasting strongly with the red fruit of the latter. Readily propagated by cuttings either of wood or root. *S. Canadensis* is one of our minor fruit plants. Elderberry wine is a common home product. The Brainard Elderberry introduced in 1890 by Brandt has fruits fully three times as large as the wild berries.

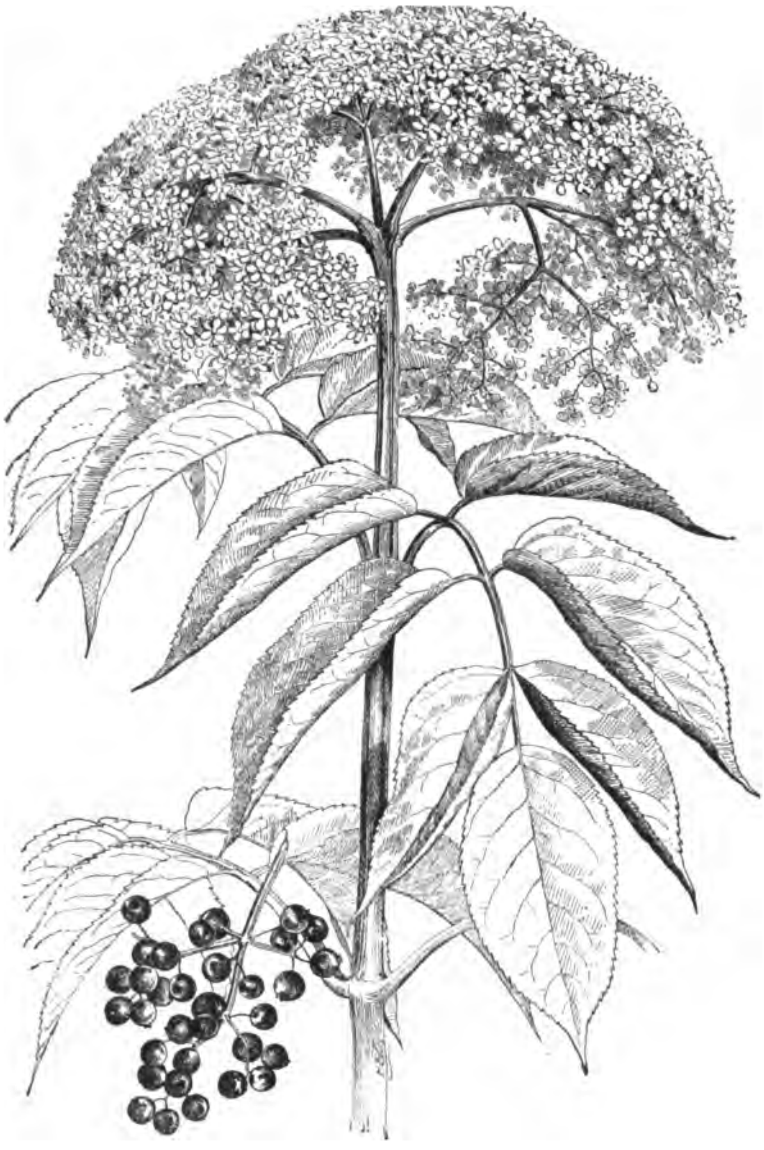
Botanically, Sambucus is closely allied to Viburnum, being essentially distinguished by the 3–5-loculed ovary, that of Viburnum being usually 1-loculed. Other generic characters: calyx 3–5-lobed or toothed; corolla rotate, 3–5-parted, lobes generally imbricate: stamens 5; disk none or convex: style 3-parted: ovule solitary, pendulous from apex: drupe 3–5-stoned: stones 1-seeded.

A. *Color of fruit black or blackish.*

B. *Fruit not glaucous.*

C. *Height 12–25 ft. when full grown.*

nigra, Linn. COMMON EUROPEAN ELDER. A large shrub or small tree, 12–25 ft. high, with rough bark; old wood hard, yellow, fine-grained: lfts. 5–9: fls. in flat 5-rayed cymes: fr. black or dark green.—May, June. The following horticultural vars. are sufficiently distinguished by their names: **argéntea, aùrea, heterophýlla, laciniàta, pulverulénta, pyramidàlis, rotuudifòlia, variegàta.** Of these var. *aurea* is distinct by reason of its yellow foliage; *laciniata* and *heterophylla* by reason of variously cut lfts., making them very effective in mass planting. Var. *variegata* is not constant in its variegation. *S. heterophylla, laciniata, variegata*, etc., of trade catalogues, are presumably varieties of *S. nigra*.



2247. Common Elder, blooming in summer—Sambucus Canadensis (× ½).

CC. *Height 5–12 ft.*

Canadénsis, Linn. COMMON AMERICAN OR SWEET ELDER. Fig. 2247. Shrubby, 5–12 ft. high; wood with white pith occupying the greater part of the stem: lvs. pinnate: lfts. 5–11, smooth: fls. white, in a flat cyme: fr. black. June, July. Fruit ripe Aug., Sept. Var. **aùrea** has yellow foliage. Var. **variegàta** has yellowish white markings. Var. **laciniàta** has the lfts. variously cut and indented. Var. **glaùca** has whitish hairs on the leaves. Gng. 6:88. Gn. 55, p. 385. B.B. 3:228.—This is the common Elder, blooming in midsummer, and one of the choicest of native shrubs although seldom appreciated. The flowers are fragrant.

BB. *Fruit glaucous, i.e., strongly whitened with a mealy bloom.*

glaùca, Nutt. Arborescent, 6–18 ft. high, glabrous throughout: lfts. 5–9, ovate to narrowly oblong. Pacific coast east to Idaho and Nev. Seed offered 1901 in S. Calif. Gn. 53, p. 68.

AA. *Color of fruit red.*

B. *Petioles glabrous.*

racemòsa, Linn. Lfts. oblong-acuminate, unequal at the base: fls. paniculate. Native of Eu.-Asia and closely resembles the next; perhaps a little taller and the twigs usually 4-angled. Vars. in the trade are **plumòsa, plumòsa aùrea** and **laciniàta,** which are not equal in value to similar forms of *S. nigra*, var. *plumosus*. Var. **aùrea,** which is being sent out in 1901, seems to belong to this species.

BB. *Petioles pubescent.*

pùbens, Michx. RED-BERRIED ELDER. Height 5–7 ft.; wood thicker than in *S. Canadensis*, pith brown; bark warty: lfts. 5–7: fls. in pyramidal paniculate cymes: fr. red. April, May. Fruit ripening in June, while *S. Canadensis* is still in flower. N. Amer. B.B. 3:228.—The American representative of *S. racemosa*, and by many considered to be identical with that species.

JOHN F. COWELL.

SAMPHIRE (*Crithmum maritimum*) is the name corrupted from *sampier*, itself a corruption of the French *Saint Pierre* (St. Peter), given to a succulent-stemmed, half-hardy perennial, well known upon rocky coasts above high tide in Great Britain as sea-fennel, parsley-pert, and St. Peter's herb. It belongs to the family *Umbelliferæ*. The plants, which attain a height of from 1–2 ft., have somewhat linear, glaucous-green, fleshy leaves, ½ in. long, small, white or yellowish flowers, which appear in umbels during July, and oblong, yellowish, fennel-like, smallish seeds of light weight, which ripen in early autumn and lose their germinating power within a year. For more than three centuries the crisp and aromatic leaves and young stems gathered in August or September have been used in salads and vinegar pickles. Samphire rarely reaches perfection in gardens far from the seacoast, unless grown upon sandy or gravelly soil, and watered frequently and plentifully with weak salt and soda solutions. It may be propagated by root division, but better by sowing the seed as soon as ripe, the plants being thinned to stand from 1–1½ ft. asunder in rows 2–2½ ft. apart.

Golden Samphire (*Inula crithmifolia*), a native of the marshes and sea-coast of Great Britain, is an erect hardy perennial, 1–1½ ft. tall, with small, fleshy leaves and yellow flowers in small, umbel-like clusters. Though grown and used like true Samphire, for which it is often sold, it lacks the pleasing, aromatic taste of the genuine. It belongs to the family *Compositæ*.

For Marsh Samphire, see *Salicornia*. M. G. KAINS.

SANCHÈZIA (after Jos. Sanches, professor of botany at Cadiz). *Acanthàceæ*. Strong, erect herbs or half-shrubby plants: lvs. large, opposite, entire or slightly toothed: fls. orange, red or purple, united into heads or spikes at the ends of the branches, or rarely paniculate; calyx deeply 5-parted, segments oblong; tube of the corolla long, cylindrical, somewhat ventricose above the middle, limb of 5 equal, short, rotund lobes; perfect stamens 2, inserted below the middle of the tube, with 2 aborted stamens between them; anther 2-celled, the cells mucronate in front; style long, with one division small, spurlike: ovary on a thick disk, 2-loculed, with 4 ovules in each cell. About 8 species in Peru, Colombia and Brazil.

nóbilis, Hook. Plants stout, erect, smooth, except the inflorescence: stem 4-angled: lvs. 3–9 in. long, oblong-ovate to oblong-lanceolate, obtusely toothed, narrowed into winged petioles, connate: fls. 2 in. long, yellow, in heads subtended by bright red bracts, the heads forming a panicle. Ecuador. B.M. 5594. F.S. 23:2437. Var. **glaucophýlla**, Lem. (var. *variegata*, Hort.). Lvs. variegated with pale yellow or white along the veins. F. 1867, p. 154. I.H. 14:528 (as *S. nobilis*); 16:580.—A hothouse plant which is very attractive when well grown, but which becomes straggling and weedy if neglected. Grown mostly for its foliage.

HEINRICH HASSELBRING.

SANDAL-WOOD. See *Adenanthera*.

SAND-BUR. See *Cenchrus*.

SANDERSÒNIA (John Sanderson, discoverer of *S. aurantiaca*). *Liliàceæ*. A genus of 1 or 2 species from Natal; tuberous plants growing 1–1½ ft. high, slender, with many sessile stem-leaves and yellow or purple globular bell-shaped flowers, pendulous from a number of the upper leaf-axils, the segments with pointed nectaries at the base. Perianth gamophyllous, urceolate: segments deltoid or lanceolate: stamens 6; filaments filiform; anthers linear-oblong, ovary 3-loculed. Glasshouse plants, to be treated like Gloriosas.

aurantiaca, Hook. Lvs. 3–4 x ¼–¾ in.: pedicels ½–1 in. long: perianth orange-colored, ¾–1 in. long. Nov. B.M. 4716. R.H. 1868, p. 311. F. W. BARCLAY.

SAND MYRTLE. *Leiophyllum*.

SAND PEAR. *Pyrus Sinensis*.

SAND VERBENA. See *Abronia*.

SANDWORT is an English name for *Arenaria*.

SANGUINÀRIA (Latin, *blood*; referring to the yellowish red juice of the plant). *Papaveràceæ*. BLOODROOT. A single species common in woods of eastern North America. Rootstock several inches long, about ½ in. thick, horizontal: lvs. radical, cordate or reniform, usually only 1 from each root bud, on petioles about 8 in. long: fls. white, often tinged with pink, 1–3 in. across, mostly solitary, on scapes about 8 in. long, appearing just preceding the full grown leaves; sepals 2, fugacious; petals 8–12, in 2 or 3 rows, oblong or obovate, early deciduous: capsule 1 in. long, oblong, 2-valved.

The Bloodroot is a showy spring flower usually found in woodland, but not a true shade-loving plant, since its growth is, to a great extent, made before the foliage of the trees expands. In cultivation it prefers a rather light soil, but will grow anywhere. It will do as well in sunlight as in shade and will even grow amongst grass, if care be taken not to mow down the leaves until it has perfected the root growth and buds for the following season. The roots are best transplanted after the leaves have ripened, until the autumn root growth commences, but they may be moved when the plants are in flower. The roots are offered at such low prices by collectors that the plant should be used to a much greater extent for spring gardening.

Canadénsis, Linn. BLOODROOT. RED PUCCOON. Fig. 2248. Described above. April–May. B.M. 162. G.W.F. 33. G.F. 8:215. Var. **plèna** has more numerous narrower petals.

F. W. BARCLAY.

2248. Bloodroot—Sanguinaria Canadensis (×[illegible]).

SANGUISÓRBA (Latin name referring to reputed medicinal properties, connected with *sanguis*, "blood"). *Rosàceæ*. About 30 species of upright mostly perennial herbs, with compound leaves and greenish, small flowers in heads: flowers usually perfect (sometimes part of them imperfect), the stamens numerous (rarely 2 or 4), the pistils mostly 1 or 2, the petals none, the uncolored calyx inclosing the mature akene. The Sanguisorbas are natives of the north temperate zone. Two species are sparingly cultivated in this country. See *Poterium*.

minor, Scop. (*Potèrium Sanguisórba*, Linn.). BURNET. Perennial, growing in clumps, glabrous or sparsely hairy: lvs. long, odd-pinnate, narrow, the small lfts. 6–10 pairs and orbicular to oblong and deep-toothed: stems 1–2½ ft. tall, terminating in small globular or oblong heads: lower fls. in the head staminate, the others perfect, the stigmas purple, tufted and exserted. Eu., Asia, and naturalized in this country.—Sometimes grown in the herb garden for the fresh young leaves, which are used in salads. It is also an interesting plant for the hardy border. Also recommended as a pasture plant, particularly for sheep. It thrives in dry, poor soils.

Canadénsis, Linn. Taller, larger in every way than the above: lfts. oblong to almost triangular-oblong, truncate or cordate at the base, long-stalked, obtuse, sharp-toothed: fl.-heads cylindrical, 2–6 in. long, the fls. all perfect, whitish. Low grounds, Mich. east and south.—An interesting plant, worthy a place in the hardy border, and sometimes sold for that purpose. It produces much foliage. Grows 5–6 ft. tall. L. H. B.

SANÍCULA (Latin, *to heal*). *Umbelliferæ*. SANICLE. BLACK SNAKEROOT. About 20 species, nearly all American, mostly perennial, glabrous herbs with alternate, palmately divided lvs. and small yellow, white or purplish fls. in compound, usually few-rayed umbels: fr. nearly globular, small, covered with hooked bristles. Woodland plants with insignificant fls. Useful occasionally as a ground cover in waste shaded places. The following species have been offered by collectors.

A. *Fls. yellow.*

Ménziesii, Hook. & Arn. Stem solitary, 1–2½ ft. high, branching: lvs. round-cordate, 2–3 in. across, very deeply 3–5-lobed: fr. about 1 line long, becoming distinctly pedicellate. Calif.

AA. *Fls. purple (rarely yellowish).*

bipinnátifida, Dougl. About 1 ft. high, with a pair of opposite lvs. at the base and 1–3 above, long-petioled, triangular to oblong in outline, 2–3 in. long, pinnately 3–5-lobed. fr. sessile. Calif.

AAA. *Fls. greenish white.*

Marylándica, Linn. Stem stout, 1½–4 ft. high: lvs. bluish green, the basal long-petioled, the upper sessile, 5–7-parted: fr. sessile. Atlantic to Rocky Mts. Common in woods.

SANSEVIÈRIA (after Raimond de Sangro, Prince of Sanseviero, born at Naples 1710. The spelling Sanseviera is not the earliest). *Hæmodoràceæ.* BOW-STRING HEMP. A genus of about 10 species from Africa and the East Indies, of essentially tender foliage plants, although beautiful in flower: rhizome short, fleshy, sometimes stoloniferous: lvs. radical, in clusters or rosettes, fleshy, firm, often long, nearly flat or terete, the interior fibrous; scape simple, long, stout: fls. white, clustered, in often dense racemes; perianth-tube narrow, often long: ovary free, 3-loculed, attached with a broad base.

Sansevierias are easily propagated by division or they may be raised from leaf cuttings about 3 in. long. These cuttings form roots in sandy soil after about one month, after which a long stolon-like bud is formed, which produces the new plant at some distance from the cutting. Sansevierias are of easy culture and are well adapted to house decoration, since they do not require much sunlight. A rather heavy soil suits them best.

A. *Lvs. flat.*

Guineénsis, Willd. Lvs. 1–3 ft. long, 3–6 in a cluster, oblanceolate, radical, dark green with lighter transverse markings: scape with inflorescence as long as the leaves; bracts 3–4: fls. greenish white, about 1½ in. long, fragrant. B.M. 1179. G.C. III. 4:73.

AA. *Lvs. concave.*

Zeylánica, Willd. Lvs. 1–3 ft. long, 8–15 in a cluster, sword-shaped, subterete, variegated with transverse markings of a grayish white: scape longer than the lvs.; bracts many: fls. whitish green, 1½ in. long. B.R. 2:160.—Rarely blooms in cult.

AAA. *Lvs. cylindrical.*

cylindrica, Boj. Lvs. often 3–4 ft. long, 8–10 in a tuft, terete, solid within, dark green, often banded with paler lines, acuminate, occasionally furrowed: scape with florescence shorter than the leaves; raceme about 1 ft. long: fls. creamy white, tinged with pink. B.M. 5093. G.C. III. 16:222. R.H. 1861, p. 448, 450.

F. W. BARCLAY.

SANTOLÌNA (derivation of name doubtful). *Compósitæ.* About 8 species of shrubs or rarely herbs, natives of Europe and Asia, mostly in the Mediterranean region. Lvs. alternate, aromatic; margins tuberculously dentate or pinnately lobed: fl.-heads yellow or rarely white, of disk fls. only, many-fld.: involucre mostly campanulate, squarrose, imbricated, appressed.

Santolina is valuable for its distinct foliage and is used for large specimens in shrubberies or as a carpet bedding plant. Cuttings for the latter purpose are usually taken in the spring from plants wintered in a frame but may be taken before frost in the fall. They are easily rooted in sand.

Chamæcyparíssus, Linn. (*S. incàna*, Lam.). LAVENDER COTTON. A hardy half-shrubby, much-branched plant, 1½–2 ft. high, with small evergreen, silvery gray lvs. and small globular heads of yellow fls., borne in summer: branches and lvs. canescent. Var. **incàna** differs but little from the type: involucre pubescent.

S. alpìna, Linn., is Anthemis montana, Linn., which makes a pretty ground cover and has yellow fls., but appears not to be in the trade.

F. W. BARCLAY.

SANVITÀLIA (after a noble Italian family). *Compósitæ.* A genus of about 4 species, natives of the southwestern United States and Mexico. Annual, usually low, much-branched herbs, with opposite, petioled, mostly entire leaves and small solitary heads of fls. with yellow or sometimes white rays: involucre short and broad, of dry or partly herbaceous bracts: receptacle from flat to subulate-conical, at least in fruit; its chaffy bracts concave or partly conduplicate: akenes all or only the outer ones thick-walled, those of the rays usually 3-angled, with the angles produced int rigid, spreading awns or horns, those of the disk ofte flat and winged.

procúmbens, Lam. A hardy floriferous annual, growing about 6 in. high, trailing in habit: lvs. ovate, abou 1 in. long: fl.-heads with dark purple disk and yellow rays, resembling small Rudbeckias, less than 1 in across, numerous: akenes of the disk flattened an often winged and 1–2 aristellate. Summer to very lat autumn. Mexico. B.R. 9:707. R.H. 1860, p. 127.—Var **flòre-plèno**, Hort. A double-fld. variety coming tru from seed, and as vigorous as the type. R.H. 1866, p. 70 Sanvitalias are of easy culture but prefer a light o sandy soil in full sunlight.

F. W. BARCLAY.

SAP. The term sap is applied to the juices of th living plant. Sap is composed of water containing mineral salts absorbed from the soil and organic substance constructed within the living cells. The water take from the oil by the roots or other absorbing organ may contain potassium, sodium, magnesium, calcium iron, and nitrates, phosphates, sulfates, and chlorids As the fluid passes from cell to cell in the livin tissues some of the mineral salts are withdrawn an used, and the water takes up some of the organic compounds which have been formed by protoplasm. As consequence of this action the sap of different parts o the plant is unlike in composition, and the sap of an organ varies with the change of season. The water o sap of a plant may comprise as much as 90 or even 9 per cent of its weight.

The mineral substances enumerated above may b found in nearly all saps; however, the limits of this not do not permit even an enumeration of the thousands c organic substances which occur in the sap of variou species. The more important ones may be grouped unde the acids, sugars, or carbohydrates, and asparagin, c perhaps some of the proteids or albumens. Many plant have become valuable commercially because of the larg proportion of some useful substance which they contai Among these may be mentioned the sugar maple, th sap of which contains over 3.5 per cent of sugar, an the sugar beet and sugar cane, in which the proportio is very much higher.

Sap is forced from the living tissues into the wood cells and vessels, and these serve as conduits in conduc ing the sap rapidly from one part of the plant to a other. The constant transpiration of water from th leaves demands an enormous supply of water from th roots. The upward passage of this supply would be t slow if conducted through the living cells. The wat taken in by the living cells of the roots is forced in the dead cells of the roots and is drawn upward throu the wood (see *Transpiration*).

The exudation pressure by which water or sap forced from the living cells is exhibited in the bleedi which ensues when stems and branches are cut awa The pressure which produces bleeding is often call root-pressure, although it is exerted by any part of t plant. Bleeding is exhibited by a large number of tre at the beginning of the growing season, and is also e pecially noticeable in the vine, dahlia, castor-oil pla calla, nicotiana and corn.

The amount of sap exuded in the process of bleedi is very great and may be equal to the total volume the plant in some instances. A specimen of *Betu papyracea* gave off over 63 lbs. of water in 24 hour *Agave Americana*, 12.5 lbs. in 24 hours. A vine m bleed from one to two pints daily, while the cucurb also exhibit very vigorous bleeding. A half gallon sap has been known to exude from a tropical liana eleven hours.

It is to be noted that the flow of sap from the su maple and other trees in the early spring, before the soil has thawed and while it is yet too cold for the living matter of the plant to show any great activity, is not due to the bleeding pressure, but to the expansion of the gases and liquids in the trunk and branches of the tree due to the direct warming action of the sun's rays. During the daytime the bubbles of air in the wood cells become heated and expand, driving the sap from the wood cells into the auger hole which has been bored into the tree. At night the trunk of the tree cools slowly and the flow ceases, to be begun again next day.

The amount of bleeding exhibited by any plant may be found if the stem is cut and bent over in such manner that the end is thrust into a tumbler or small vessel, which will serve to collect the escaping sap.

The ordinary upward movement of sap takes place through the most recently formed wood cells at a rate that varies from a few inches to a yard an hour. The force which lifts the sap is ultimately derived from the sun. The cells in the leaf contain many substances which attract water, and the sun shines on these cells, evaporating some of the fluid; the loss is replaced from the nearest cells below by osmotic attraction and the pull thus exerted may serve to draw water from the roots to the leaves even in the tallest trees, although it is to be said that not all of the question of the ascent of sap may be satisfactorily explained by the facts at hand. See *Physiology of Plants*. D. T. MacDougal.

SAPÍNDUS (Latin words meaning *soap* and *Indian;* alluding to the use of the fruit in India). *Sapindàceæ.* Soapberry. A genus of about 12 species of trees, shrubs or woody vines inhabiting the tropical regions of the whole world. Wood yellow: lvs. alternate, exstipitate, abruptly pinnate: fls. white, small, in lateral or terminal racemes or panicles; sepals 5, obtuse, rarely petaloid; petals more or less pubescent and bearing just above the short claw a villous or ciliated comb or appendage; disk annular, usually crenate, bearing 8–10 stamens: seeds with long testa and no aril, black or nearly so.

The fruit has an alkaline principle known as saponin which makes it useful for cleansing purposes. The fruit was much used in eastern countries before the introduction of soap and is still preferred for washing the hair and cleansing delicate fabrics like silk.

A. *Lfts. 4–7.*

Saponària, Linn. A small tree with rough grayish bark: lfts. oblong-lanceolate and acute to elliptic-ovate and somewhat obtuse, opposite or alternate, entire, glabrous, veiny and lucid above, tomentulose beneath: rachis usually winged: fr. lucid, 6–8 lines in diam. S. Fla., W. India and S. Amer. Cult. in S. Fla. and S. Calif.

AA. *Lfts. 7–18.*

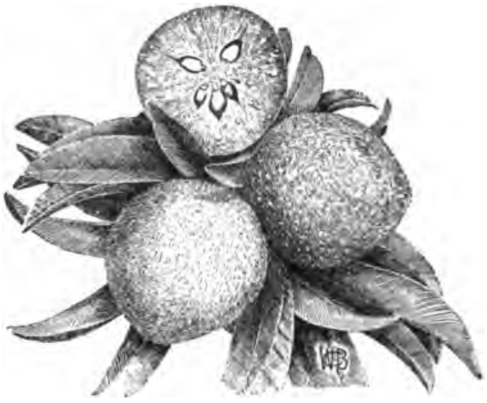
marginàtus, Willd. A tree reaching ultimately 60 ft. in height: lfts. 7–13, lance-oblong, acuminate, glabrous above, paler beneath and somewhat pubescent on the midnerve, 2–5 in. long, the upper nearly opposite, the lower alternate; rachis wingless, narrowly margined or marginless: fls. white, sometimes tinged with red in pyramidal panicles; petals ciliate and bearing near the base a 2-lobed villous scale; filaments villous: fr. yellow, about 8 lines long. May, June. Kan. to Tex., Ariz. and N. Mexico. B.B. 2:402.—Cult. for ornament in S. Fla.

ùtilis, Trab. A species from S. China which is not distinguishable from *S. marginatus*, Willd., by descriptions. Lfts. 12–14, acute, glabrous: fr. glabrous, nearly globose, strongly keeled. R.H. 1895, p. 304.—According to Franceschi this tree is cult. in Algeria, where it comes into bearing in 8–10 years. "The berries contain 38 per cent of saponin. Trees have been known to yield $10 to $20 worth of berries every year. The trees prefer dry, rocky soil." F. W. Barclay.

SÀPIUM (old Latin name used by Pliny for a resiniferous pine). *Euphorbiàceæ.* About 25 species of milky-juiced tropical trees or shrubs. Lvs. opposite, petioled; petioles and scale-like bracts biglandular: fls. in terminal spikes, the pistillate single below, the staminate in 3's above, all apetalous; sepals imbricated, united below; stamens 2–3; filaments free: capsule with 2–3 1-seeded locules, more or less fleshy, a 3-winged central column remaining after dehiscence.

sebíferum, Roxb. (*Excæcària sebífera*, Muell. *Stillingia sebífera*, Michx.). Tallow Tree. Lvs. 1–2 in. long, ovate, acuminate, long-petioled, glabrous: capsules ½ in. in diameter; seeds covered with a waxy coating which is used in the native land, eastern Asia, for making candles. Now cultivated in many warm regions. Naturalized in southern United States.
J. B. S. Norton.

SAPODILLA, or **NASEBERRY** is a common name of **Àchras Sapòta,** Linn. (*Sapòta Achras*, Mill.), a tree of the West Indies, Central America and northern South America, cultivated as far north as Lake Worth, Fla., for its fruits. Fig. 2249. It is one of the *Sapotaceæ*. It is an evergreen tree, the thick, lance-oblong, entire, shining lvs. clustered at the ends of the branches. The fls. are borne on the rusty-pubescent growths of the season; they are small and perfect; calyx with 6 lobes in 2 series; corolla 6-lobed, whitish, scarcely exceeding the rusty calyx; stamens 6. Fruit size and color of a small russet apple, very firm, with 10–12 compartments containing large black seeds, the juice milky, flavor sweet and pear-like. The fruit is much prized in warm countries. From the juice, large quantities of chewing gum are made. As ordinarily seen in the South and in the West Indies, it is a bushy tree 10–20 ft. high, making a handsome subject. It is said to bear well in pots.
L. H. B.



2249. Sapodilla, the fruit of Achras Sapota (× ½).

SAPONÀRIA (Latin for *soap;* the roots can be used like soap for washing). *Caryophyllàceæ.* Soapwort. A genus of about 25 species of annual or perennial herbs, natives of Europe and Asia, allied to Silene and Gypsophila. Calyx ovoid or oblong-tubular, 5-toothed, obscurely nerved: petals 5, narrowly clawed, limb entire or emarginate, scaly at the base or naked; stamens 10: ovary many-seeded: style 2, rarely 3: capsule ovoid or oblong, rarely nearly globose.

Saponarias are readily established in any soil and require but little care. *S. ocymoides* is an attractive plant for the rockery or for edging. Propagated by seed or division.

A. *Stem stout, erect.*

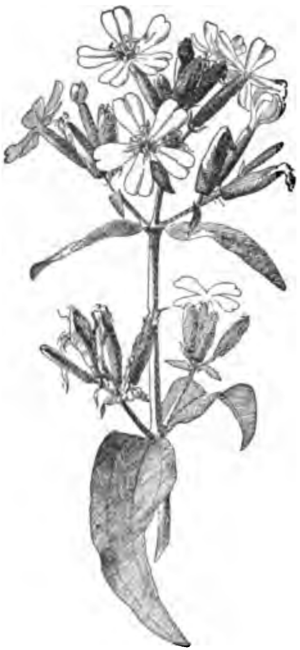
officinàlis, Linn. Bouncing Bet. Fig. 2250. A perennial: stems 1½–2½ ft. high, leafy, simple, clustered, glabrous: lvs. mostly oblong-lanceolate, 3-nerved: fls. light pink (nearly white in shady situations), in compact, corymbose, paniculate cymes; calyx glabrous, the teeth triangularly acuminate; petal lobes obovate, entire, notched at apex. July, Aug. Europe.—Var. **flore-plèno** is quite double-flowered. *S. Caucásica*, Hort., is said to be a deeper-colored double form.

AA. *Stem slender, decumbent.*

B. *Lvs. obtuse: plants annual.*

Calábrica, Guss. A low-growing annual, with pink fls.: lvs. oblong-spatulate, obtuse, about 1-nerved: fls.

in a loose corymbose panicle; calyx-teeth ovate, obtuse, membranous-margined. Spring. Italy, Greece. R.H. 1851:281.—Var. **álba** is also in the trade. Seed should be sown in the fall for spring bloom or in April for summer flowering.


2250. Saponaria officinalis (× ½).

BB. *Lvs. acute: plant perennial.*

ocymoides, Linn. Stems much branched, 6–9 in. high, half-trailing: lvs. ovate-lanceolate, about 1-nerved, small, acute: fls. bright pink, in loose, broad cymes. Summer. Europe.—Several varieties are in cultivation, including var. **álba.**

S. Japónica, Hort. John Saul, seems to be unknown to botanists.

J. B. Keller and F. W. Barclay

SAPROPHYTE (Greek, *rotten*, and *plant*, i. e., living on dead organic matter). A plant (whether bacterium, fungus or higher plant) subsisting upon the humus of the soil, or dead or decaying organic materials. The customary classification which includes under the term "saprophyte" all bacteria that do not subsist on living plants or animals no longer corresponds with facts. The integrity of the classification has been destroyed by the discovery of certain bacteria in the soil, as the nitrifying bacteria, which are able, even without sunlight, to appropriate the carbon dioxid of the atmosphere. Among the fungi we class as saprophytes all plants which live upon a dead or decaying organic substratum. Such are the baker's yeast (*Saccharomyces cerevisiæ*), the mushroom (*Agaricus campestris*) and the stinkhorn (*Phallus impudicus*). Most mushrooms and toadstools are saprophytes (Fig. 2251). Some of the flowering plants possessing ectotrophic mycorhiza (Indian pipe, *Monotropa uniflora*) and endotrophic mycorhiza (*Neottia nidus-avis*, *Corallorhiza innata*, *Epipogum aphyllum*, snow plant, *Sarcodes sanguinea* and *Thismia Aseroë*) are also classed as saprophytes. John W. Harshberger.

2251. A saprophytic plant—Mushroom.

SARÁCA (from *Sarac*, the name of the genus in India). *Leguminòsæ.* About 6 species of tropical Asiatic trees, with glabrous, rigid-coriaceous, abruptly pinnate lvs. and yellow, rose or red fls. in dense, sessile, axillary, corymbose panicles with somewhat petal-like, reddish bractlets: calyx cylindrical, with a disk at its summit; limb 4-lobed; lobes oblong, unequal, petal-like; corolla wanting; stamens 3–8, exserted; filaments filiform; anthers versatile, opening longitudinally: fr. a coriaceous flat pod.

Índica, Linn. A medium-sized tree: lfts. 6–12, ovate-lanceolate, acuminate, 4–6 in. long, entire, short-petioled: fls. orange-red, fragrant, collected in compact, roundish panicles which are shorter than the lvs.; stamens usually 6 or 7, inserted on the fleshy annular ring at the summit of the calyx-tube; style long, curved: bracts red, appearing as a calyx; pod 4–10 in. long, 4–8-seeded; seeds oblong, compressed, 1½ in. long. B.M. 3018.—It has flowered well with greenhouse treatment at height of 4 ft. It is suitable for outdoor planting only in tropical regions. Procurable from southern Florida.

F. W. Barclay.

SARCÁNTHUS (name from Greek words signifying *flesh* and *flower*, in allusion to the fleshy nature of the blossom). *Orchidàceæ.* A small genus related to Vanda Owing to the smallness of the flowers they are rarel cultivated. Sepals and petals similar: labellum firml united with the base of the column, spurred, with small lateral lobes and a longer concave middle lobe Foliage and habit of Vanda.

Give plenty of water in the growing season. The should have basket culture, with fern root, and a tem perature of 65° to 85°. When at rest, give very littl water and reduce the temperature to 55°. Culture practically as for Vanda.

teretifòlius, Lindl. (*Luisia tères*, Lindl.). Stem 1 ft. high, with cylindrical lvs. 2–4 in. long: raceme bearing 7–8 inconspicuous fls.: sepals and petals oblong, dull green, with red disk; labellum slipper-shaped, white, lateral lobes edged with red. Sept. China. B. M. 3571.

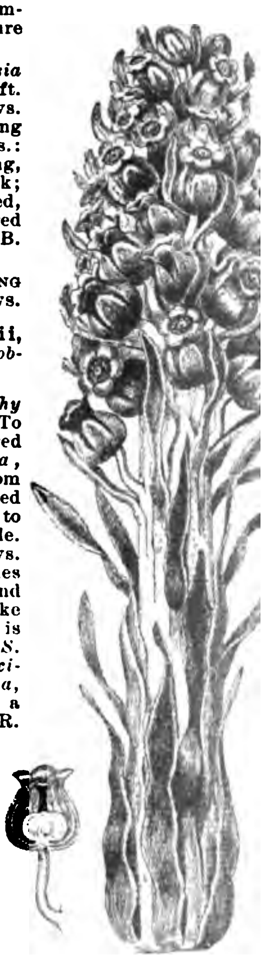
Heinrich Hasselbring and Wm. Mathews.

SARCOBÒDIUM Lobbii, Beer, is *Bulbophyllum Lobbii.*

SARCOCÓCCA (*fleshy berry*). *Euphorbiàceæ.* To this genus is to be referred *Pachysandra coriacea*, Hook., a small shrub from India, sometimes cultivated in Europe but not known to be in the American trade. It has simple plum-like lvs. and short, axillary racemes of small yellowish fls., and a small purple plum-like fruit. Its proper name is **S. prunifórmis**, Lindl. (*S. saligna*, Muell. *S. salicifòlia*, Baill. *S. coriàcea*, Sweet). It is treated as a cool greenhouse plant. B.R. 12:1012.

SARCÒDES (Greek, *flesh-like*). *Ericàceæ.* *Sarcòdes sanguinea*, Torr. (Fig. 2252), is the Snow Plant of the Sierra Nevadas. It is a low and fleshy plant growing 3–12 in. high and entirely devoid of green leaves. It belongs to that strange group of the heath family which comprises the fleshy and parasitic plants, of which our Indian pipe or corpse-plant is an example. Few spec are known in this suborder, and they are all local or ra

The Snow Plant derives its popular name from habit of shooting up and blossoming as soon as snow melts away in the spring. The specific name *s guinea* refers to the blood-red color of the entire pla The Snow Plant grows at an altitude of 4,000 to 9, feet. It is the only species of the genus, and is known to be in cultivation.


2252. Snow plant—Sarcodes s guinea. Natural size.

SARRACÈNIA (Dr. Jean Antoine Sarrazin, an ea botanist of Quebec, who sent *S. purpurea* to Tour fort). *Sarraceniàceæ.* Pitcher Plant. Side-sad

FLOWER. Three small genera and 8 or 10 species comprise the family *Sarraceniaceæ*. All the plants are American. The six or eight species of Sarracenia inhabit swamps and low grounds in the Atlantic states; *Darlingtonia Californica*, grows in mountain bogs in California and southern Oregon; *Heliamphora nutans* grows on Mt. Roraima in British Guiana. They are all perennial acaulescent bog plants, with hollow pitcher-like leaves, and nodding flowers single or several on short scapes. The pitchers catch organic matter and entrap insects, and the plants often utilize these materials for food. In some species there are contrivances of form, hairs, and lines of color that appear to have special relation to the capture of insects and other creeping things. See *Darlingtonia*. The plants are prized as horticultural subjects because of their oddity and the botanical interest that attaches to them. The Sarracenias have been much hybridized, giving rise to distinct and interesting intermediate forms, but these hybrids are known only to specialists and fanciers. Heliamphora is not in the American trade, but all the other species are. They are considered to be difficult to maintain in perfect condition under cultivation, and, whenever possible, plants are frequently renewed from the wild. They are best treated as semi-aquatic plants. Give plenty of moisture at growing season. Keep partially dormant in winter.

The botanical position of the Sarraceniaceæ is not settled. Ordinarily it is placed near the Papaveraceæ and Cruciferæ. Others associate it more intimately with the Droseraceæ. The fls. are perfect, the parts mostly free and distinct; sepals and petals each 5; stamens many; carpels 3–5, united into a compound pistil, bearing many ovules on axile placentæ. In Sarracenia itself, the flower is large and solitary, nodding from the top of a rather stiff scape; petals colored, ovate to more or less fiddle-shaped, incurved ; sepals thick and persistent; 3 bracts beneath the calyx; the top of the pistil dilated into a broad, thin, umbrella-like structure on the margin of which the stigmatic surfaces are borne; fr. a 5-valved capsule. See Gray, Syn. Fl. 1, p. 79. Masters, G.C. II. 15:817; 16:11, 40. For an account of hybrid Sarracenias, see also Gn. 28, p. 217, and 48, p. 202.

L. H. B.

All of the species comprising those which are indigenous to the southern states only, including *S. flava*, *S. psittacina*, *S. rubra*, *S. variolaris*, and *S. Drummondii*, are hardy in the botanic garden at Washington. However, they do not grow equally well out of doors. *S. flava*, *S. rubra*, and *S. variolaris* succeed best. *S. psittacina* and *S. Drummondii* do poorly. They are planted in a raised bed, the sides of which are made of rocks cemented together so as to be capable of being flooded with water. Provision is made for drainage by means of a pipe in the bottom, which is opened or closed as occasion requires. The compost is made up of chopped fern roots, moss, sand, charcoal and potsherds, and when planted a top-dressing of live moss is given. In this bed other insectivorous plants are grown, as Dionæa, Darlingtonia, Drosera and Pinguicula. *S. flava* and *S. purpurea* are sometimes well grown on margins of lily ponds, if given compost of the above description.

For pot culture in northern greenhouses *S. Drummondii* is the most attractive species. It produces two crops of leaves each year. Those developed in spring, while more numerous, are not so beautifully marked as those which make their appearance during the fall months. *S. flava* comes next in importance as a pot-plant. Out of a large number of hybrids, those having as parents *S. rubra*, *S. purpurea* and *S. variolaris* take on high coloring in the leaves.

Propagation should be effected by division of the rhizome at the time of repotting; this should be done before growth begins. New forms are raised from seed. All of the species intercross readily.

Sarracenias thrive best in a substance through which water will pass readily. During the growing period they need an abundant supply of moisture. They are best grown in a sunny coolhouse. Greenfly and thrips are the most troublesome pests. Greenfly is most abundant during the earlier stages of the leaves, the thrips appearing later.

G. W. OLIVER.

INDEX.

acuminata, 6.
alba, 5.
Atkinsoniana, 7.
atrosanguinea, 4.
Catesbæi, 4.
Chelsoni, 8.
Courtii, 9.
crispata, 4.
Drummondii, 5.
erythropus, 4.
Fildesi. 4.
flava, 4.
limbata, 4.
Maddisoniana, 10.
Mandaiana, 11.
maxima, 4.
melanorhoda, 12.
Mexicana, 5.
minima, 4.
minor, 6.
Mitchelliana, 13.
ornata, 4.
picta, 4.
purpurea, 2.
psittacina, 1.
rubra, 5, 6.
Rugelii, 4.
Swaniana. 14.
Sweetii, 6.
undulata, 5.
variolaris, 3.
Williamsii, 15.
Wrigleyana, 16.

I. SPECIFIC TYPES.

A. *Pitchers spreading horizontally or obliquely.*

B. *Hood concave and covering the orifice.*

1. **psittacina,** Michx. Pitchers small (not exceeding 6 in. long), cylindrical, reclined, broad-winged, green below but purple-veined about the middle and purple with white spots on the top and hood, densely and retrorsely hairy within: petals purplish, ½ in. long. Pine barren swamps, Georgia, Alabama, Florida. G. C. II. 15:816. F. S. 20:2063. F. 1877, p. 254.

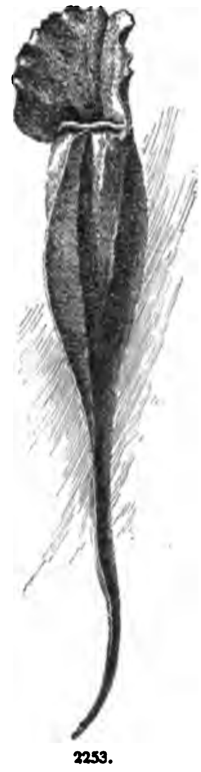
BB. *Hood flattish, erect or soon becoming so.*

2. **purpùrea,** Linn. COMMON PITCHER PLANT of the North, and the one on which the genus was founded. SIDE-SADDLE FLOWER. Fig. 2253. Pitchers ascending, relatively short and thick, 8–12 in. long, enlarging upwards, more or less purple-veined, broad-winged, the large, round-cordate hood hairy and purple-veined within: scapes 1–2 ft. tall, bearing a flower 2 in. across, with lurid purple petals. Sphagnum bogs, Labrador to Florida, and west in Canada to the Rocky Mts. B.M. 849. L.B.C. 4:308. G.C. II. 15:821. F.S. 10:1076. Mn. 1:81. G.W.F. 50.—Variable. In some forms the fls. are yellowish and the lvs. are not purple-veined. According to Loddiges, writing in 1823, this species was "cultivated before the year 1640, by Tradescant, who was gardener to King Charles the First."

AA. *Pitchers erect, long and slender.*

B. *Hood concave, standing over the orifice.*

3. **variolàris,** Michx. Fig. 2254. Pitchers narrow, sometimes 1½ ft. long, either broadly or narrowly winged, more or less variegated and veined with purple (the under color yellowish white), the cucullate hood covering the orifice and purple-veined within: petals 1 in. or more long, yellow or yellowish green. Low grounds, N. Car. to Fla. B.M. 1710. L.B.C. 9:803. Mn. 4:1. Gn. 48, p. 203.



2253. Sarracenia purpurea. (× ⅓.)

BB. *Hood expanded, erect or soon becoming so.*

C. *Base of hood much contracted or recurved at the sides.*

4. **flàva,** Linn. Tall, the narrow, trumpet-like pitchers 2 ft. long, which are yellowish green and not spotted, the wing very narrow, the hood ovate and soon becoming erect and hairy and purple-spotted within: petals 1½ in. long, but enlarging to nearly or quite twice that length, oblong and drooping, light yellow. Bogs and swamps, N. Car. (Va.?) to Fla. B.M. 780. L.B.C. 20:1957. R.H. 1852:121. F.S. 10:1068–9. Gn. 30, p. 367; 48:1031; 57, p. 326. Mn. 2:113.—This seems to be the most variable of the Sarracenias, and some of the forms referred to it may be distinct species. Var. **atrosanguinea,** Bull. (*S. atrosanguinea*, Hort.). Small: lid or hood ovate-acute, deeply stained with red. G.C. II. 16:13. I.H. 27,

p. 86 bis. Var. **crispàta,** Hort. (*S. crispata*, Hort.). Differs from the species "in the deeper wing to the pitcher, the strongly reflected margins of the sepals, the white petals, the blunter, less conical ovary and the shorter and blunter lobes to the disk of the style." Pitchers about 2 ft. long. G.C. II. 15:633; 16:9. I.H. 41, p. 301. Said by some to be a hybrid of *S. rubra* and *S. flava*, but Masters does "not see any grounds for the suggestion." Var. **erýthropus,** Bull (*S. Rugèlii*, Shuttl.). Large, the lid or hood blotched with crimson at the base. Var. **limbàta,** Bull. Large, limb of the lid or hood bordered with band of brownish crimson ¼ in. wide. Var. **máxima,** Hort. Pitchers large, with green lids. Var. **mínima,** Hort. Small in all its parts. Var. **ornàta,** Bull. Pitchers large, green, red-veiny, the inner face of the long-stalked lid bearing a network of red veins: fls. said to be 8 in. across, canary yellow. G.C. II. 15:629, 633; 16:12. Var. **picta,** Bull (*S. Catesbæi*, Ell. *S. flàva*, var. *Fildesi*, Williams. *S. Fildesi*, Hort.). Pitchers very large, red-veiny, with flat roundish wing.

2254. Sarracenia variolaris. (× ⅙).

CC. *Base of hood broad, or only moderately contracted.*

D. *Lid or hood suborbicular.*

5. **Drúmmondii,** Croom. Pitchers large and erect, 2–3 ft. long in well-grown specimens, funnel-shaped, green and prominently nerved, the upper part of the pitcher richly variegated with purple reticulations and creamy white inter-spaces, the wing narrow; lid roundish, the base somewhat contracted, flattish or with recurved mostly wavy margins, becoming erect, hispid on the inner face: fls. 4 in. across, red-brown. Pine barrens, S. W. Ga. and adjacent Fla. G.C. II. 15:633; 16:8. F.S. 6:560; 10:1071–2. I.H. 41, p. 303.—A very striking species, with its tall pitchers strongly variegated at the top. Var. **rùbra,** Hort., has pitchers with deep red markings. Var. **álba,** Hort., has paler variegations and flowers. Var. **undulàta** (*S. undulàta*, Decne.) has stouter less elongated pitchers, and strongly undulated lid. *S. Mexicana*, Hort., is said to be a small form of this species.

DD. *Lid ovate-pointed or acuminate.*

6. **rùbra,** Walt. Pitchers erect and narrow, 10–15 in. long and 1 in. or less across at the orifice, green with reddish veins above, the wing broad: lid or hood ovate, short-acute (or nearly obtuse) to acuminate, becoming erect and concave, veined and tinted with red, the inner face somewhat pubescent: fl. 3 in. across, the pendulous petals whitish at the base and red-brown above. Swamps, N. Car. to Ala.—Said to hybridize in the wild with *S. purpurea*. Var. **acuminàta,** DC. Lid long-acuminate. B.M. 3515. L.B.C. 12:1163. Var. **Sweètii,** Mast. (*S. minor*, Sweet, not Walt. *S. Sweètii*, DC.). Smaller: pitchers cylindrical, with a narrow wing: lid ovate-acuminate. F.S. 10:1074.

II. HYBRID TYPES.

7. **Atkinsoniàna.** *S. flava*, var. *maxima* × *S. purpurea:* More like *S. flava;* pitchers long and slender, green, with red reticulations: lid broad, cordate, red-veined.

8. **Chélsoni.** *S. rubra* fertilized by *S. purpurea:* "The pitchers in direction are midway between the erect pitchers of rubra and the somewhat spreading tubes of purpurea, in length they resemble those of rubra, in form they are intermediate between those of rubra and purpurea, and the lid is almost the same as that of the last species." *Masters*. Raised by Veitch. G.C. II. 13:725; 15:817. I.H. 27:388. S.H. 1:189.

9. **Còurtii.** *S. purpurea* × *S. psittacina:* "It has decumbent pitchers about 8 in. long and colored a rich deep crimson, their form being intermediate between that of the two parents." Raised by Mr. Court, at Veitch's. S.H. 1:177.

10. **Maddisoniàna.** *S. psittacina* crossed with *S. variolaris:* compact and dwarf: pitchers short and broad, incurving, ascending, green with dull red veins: lid large, ovate and undulate, deep purple-veined.

11. **Mandaiàna.** *S. flava*, var. *rubra* × *S. Drummondi:* Described as follows in Pitcher & Manda's Novelty Catalogue of 1893: "A few plants of this rare and beautiful plant has been collected, growing in company with *S. flava* and *S. Drummondi*, of which it is no doubt a natural hybrid, being intermediate between the two above-named species. The pitchers grow about two feet in height, are trumpet-shaped and broad at the opening; color light green with slight white mottlings. The lid is large and broad, slightly incurving, undulated at the edges, dark green shaded with red and blotched with white."

12. **melanorhòda.** *S. purpurea* × *S. Stevensii*, the latter a hybrid of *S. purpurea* and *S. flava:* "In habit it is like *S. purpurea*, the pitchers being obliquely ascending and distended like those of purpurea, 6–7 in. high, with a deep wing, narrowing to either end, and a roundish sessile lid 2½ in. across. The color is like that of *S. Chelsoni*." *Masters*. Raised at Veitch's.

13. **Mitchelliàna.** *S. Drummondii* × *S. purpurea:* growth of *S. purpurea*, but more erect-growing and more graceful: pitchers 9–12 in. tall, rich green with crimson veins: lid reticulated with red, undulate.

14. **Swaniàna.** *S. purpurea* × *S. variolaris:* aspect of *S. purpurea*, but more erect: pitcher 12 in. tall, funnel-shape, slightly curved, greenish purple.

15. **Williamsi.** Supposed natural hybrid of *S. purpurea* and *S. flava:* "The pitchers are 9–12 in. high, erect, bright light green, streaked and veined with crimson, with a broad lid like that of *S. purpurea*. It was imported by Mr. B. S. Williams, with a consignment of *S. flava*." *Masters*. G.C. II. 15:629.

16. **Wrigleyàna.** *S. psittacina* × *S. Drummondii*, var. *alba:* Pitchers intermediate between those of the parents, 12–15 in. high, and slightly curved, mottled with white and finely reticulated with bright light red. G.M. 32:301.

Other hybrids, not known to be in the Amer. trade, are as follows: *S. décora:* S. psittacina × S. violaris?—*S. excéllens:* S. variolaris × S. Drummondi, var. alba.—*S. excúlta:* S. flava, var. atrosanguinea × S. Drummondi.—*S. exornàta:* S. purpurea × S. flava, var. crispata.—*S. formòsa:* S. psittacina × S. variolaris. S. psittacina was the pistillate parent.—*S. illustràta:* S. Stevensi × S. flava.—*S. Moòrei:* S. flava (pistillate) × S. Drummondi. "Supposed to be the first hybrid Sarracenia raised artificially." G.C. II. 16:44.—*S. Pátersoni:* S. purpurea × S. flava.—*S. Pòpei:* S. flava × S. rubra. G.C. II. 16:41; III. 12:127.—*S. Sanderiàna:* S. Drummondi, var. rubra × ——— ? Gt. 46, p. 524.—*S. Stèvensi:* S. flava (pistillate) × S. purpurea. G.C. II. 16:40.—*S. Tolliàna:* S. flava × S. purpurea.—*S. vittàta maculàta:* S. purpurea × S. Chelsoni.—*S. Willisii:* S. Courtii × S. melanorhoda. G.M. 37:411.—*S. Wilsoniàna:* S. flava × S. purpurea.

L. H. B.

SARSAPARILLA of commerce comes from various species of Smilax. Wild Sarsaparilla of America is *Aralia nudicaulis*.

SÁSSAFRAS (Spanish, *Salsafras*, Saxifraga; medicinal properties similar to those of Saxifraga were attributed by Spanish discoverers). *Lauràceæ*. Ornamental deciduous tree, with alternate, simple or 3-lobed leaves and small yellow flowers appearing in few-flowered racemes in early spring and followed by ornamental dark blue fruit on red stalks. The Sassafras usually affects light lands, although it may grow in clay loams. It is a desirable tree for ornamental planting on account of its handsome light green foliage, which is interesting with its varying shapes and its orange-yellow or bright red color in autumn, and on account of its decorative bright-colored fruit. It prefers, at least in the North, a warm and sunny position. It is not easily transplanted when old on account of its long tap-roots. Prop. by seeds sown as soon as ripe; also by suckers, which are often freely produced, and by root-cuttings.

One species in eastern N. America. Fls. diœcious, rarely perfect, apetalous; calyx 6-parted; stamens 9, the 3 inner ones furnished at the base with 2-stalked, orange-colored glands; anthers opening, with 4 valves: ovary superior, 1-loculed: fr. an oblong-ovoid, 1-seeded, dark blue drupe surrounded at the base by the thickened scarlet calyx.

officinàle, Nees (*S. Sássafras*, Karst. *S. variifòlium*, Kuntze. *Laùrus Sássafras*, Linn.). Figs. 2255 (winter tree), 2256. Tree, 30–60, or occasionally 90 ft. high; young branches bright green: lvs. oval and entire, or 3-lobed almost to the middle, obtusish, silky-pubescent when young, glabrous at length, 3–4 in. long: fls. yellow, ¼ in. across, in several-fld. racemes, umbellate when unfolding, afterward at the base of the young branchlets: fr. ⅛ in. high. April, May. Mass. to Ont. and Mich., south to Fla. and Tex. S.S. 7:304–305. Em. 2:360. G.F. 7:215. Gn. 31, p. 449.

2255. Sassafras tree.

Alfred Rehder.

SATIN FLOWER. See *Sisyrinchium*.

SATURÈIA, or **SATUREJA.** See *Savory*.

SAUNDERS, WILLIAM (Plate XLVI), horticulturist and landscape gardener, was born at St. Andrews, Scotland, in 1822; emigrated to America in 1848; was appointed botanist and superintendent of propagating gardens, U. S. Department of Agriculture in 1862, and died at Washington, D. C., Sept. 11, 1900. When Mr. Saunders first came to America he served as gardener in a number of places, first at New Haven, Conn., and later near Germantown, Pa. He was instrumental at this time in the improvement of a number of important private and public properties, such as Clifton Park in Baltimore, an estate of 400 acres; Fairmount and Hunting Parks in Philadelphia, and cemeteries at Amboy and Rahway, New Jersey. Mr. Saunders' most important piece of work in landscape gardening was in connection with the planting and laying out of the Gettysburg Cemetery. Soon after finishing this work, he took up his duties as superintendent of the gardens and grounds of the U. S. Department of Agriculture. Through his efforts much was done towards beautifying the streets of Washington in the planting of trees and the improvement of the parks. The grounds of the U. S. Department of Agriculture were laid out and planted by Mr. Saunders, and for a number of years after the work was inaugurated he was actively engaged in introducing plants from all over the world, testing the same and making distributions wherever it was thought they might succeed. One of the most important of his introductions was the navel orange, which was first called to his attention by a woman from Bahia, Brazil, about 1869. Mr. Saunders secured about a dozen budded trees and planted them in the greenhouses at Washington. Soon after some of the bud wood was distributed in California, and these few trees formed the nucleus for the large plantings of the navel oranges now at Riverside and elsewhere. While Mr. Saunders had been known best as a horticulturist, he was prominently identified with many other important movements looking toward the advancement of agriculture in this country. As early as 1855 he was actively engaged in an effort to organize an association of farmers, and this work eventually resulted in the formation of the Grange, of which he is often called the father. His sturdy character, sympathetic nature and kindly disposition endeared him to all who came in contact with him.

B. T. Galloway.

SAUROMÀTUM (*saura*, lizard; referring to the spotted flower). *Aràceæ*. Perennial herbs, with unisexual naked fls. Tubers bearing a single pedate leaf one year, the next year lvs. and fls.: petioles cylindrical, spotted below: blade pedately parted; peduncle short: spathe soon withering, its tube oblong, swollen at the base, more or less connate, its blade or banner long-lanceolate, black-purple, variously spotted. Species 6. India, Java and Trop. Africa. DC. Mon. Phaner. vol. 2.

The following are hardy bulbous plants, with large and curious flowers. The fls. are produced from Jan. until June, and the bulbs have kept well in a dry state for a year. There is little danger of the bulbs shriveling or rotting. Plant them 6 in. deep in pots or in the garden. Easily managed by the amateur.

guttàtum, Schott. Petioles 3 ft. long, not spotted; leaf-segments 6–8 in. long, 2–3 in. wide, the lateral smaller: spathe-tube green on the back, 4 in. long, the upper third narrowed; blade 12 in. long, 2 in. wide below, gradually narrowing above, olive-green on the back, yellowish green within, with dense, irregular black-purple spots. Himalayas. B.R. 12:1017 (as *Arum venosum*).

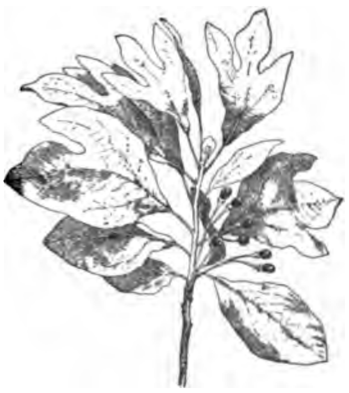
venòsum, Schott. (*S. Simlénse*, Schott.). Petioles spotted, 3½ ft. long; leaf-segments 8–10 in. long, 4 in. wide, the lateral smaller: spathe-tube 3–4 in. long, purple on the back: blade 14–16 in. long, 3 in. wide below, about 1 in. wide from the middle to the apex, purple on the back, yellow within and with crowded oblong purple or black spots. Himalayas. B.M. 4465 and F.S. 13:1334 (both erroneously as *S. guttatum*).

Jared G. Smith.

SAURÙRUS (Greek, *lizard's tail;* referring to the curve of the spike of fls.). *Piperàceæ*. The Lizard's Tail is a hardy perennial herb suitable for the bog garden. It has been offered by several dealers in native plants. It grows in swamps, has heart-shaped leaves, and bears, from June to Aug., small white fragrant flowers in a dense terminal spike, the upper part of which arches or nods gracefully. Herbs with jointed stems, alternate, entire lvs. and perfect fls. in spikes, entirely destitute of floral envelopes and with 3–4 ovaries: stamens mostly 6 or 7: fr. somewhat fleshy, wrinkled; carpels 3–4, indehiscent, united at base.

cérnuus, Linn. Lizard's Tail. Fig. 2257. Height 2–5 ft.: lvs. petioled, ribs converging. Conn. to Ont., Minn., Mo. and southward. B.B. 1:482.

W. M.



2256. Sassafras officinale (× ⅙).

SAVIN. *Juniperus Sabina* and *J. Virginiana*.

SÀVORY. Summer Savory is *Satureia hortensis*, Linn. *Labiatæ*. Cultivated in kitchen gardens for its aromatic green parts, which are gathered in midsummer for flavoring meat, dressings and other culinary preparations. The slender, errect, branching, herbaceous stems, 10–12 in. tall, bear soft, narrow, green leaves and clusters of pink, purplish or white flowers in summer, which are followed by brown ovoid seeds whose vitality lasts three years. Propagation is by means of seed, which is sown in drills 12–18 in apart in April or May in light, mellow, well-drained loam of moderate richness. When 2–3 in. tall the plants are thinned to 5 or 6 in. asunder, or for early crop they may be transplanted from hotbeds sown in March.

Winter Savory (*S. montana*, Linn.) is a hardy European perennial species, having much the qualities of the annual. It may be managed like thyme. It has woody, slender, very branching stems 12–16 in. tall, narrow, very acute leaves, white, pink or lilac flowers and brown seeds, whose average vitality is three years.

M. G. Kains.

SAVOY is a kind of cabbage.

SAW PALMETTO. *Serenœa serrulata.*

2257. Saururus cernuus (× ⅛). (See page 1617.)

SAXÍFRAGA (Latin, *rock* and *to break;* said by some to refer to the fact that many of the species grow in the clefts of rock, by others to the supposition that certain species would cure stone in the bladder). *Saxifragàceæ.* Saxifrage. Rockfoil. As outlined below (including Megasea), the genus contains upwards of 175 species, widely distributed in the north temperate zone, many of them alpine and boreal. In the southern hemisphere they seem to be known only in South America. The Saxifrages are herbs, mostly perennial, with perfect small white, yellow or purplish flowers in panicles or corymbs; calyx with 5 lobes; petals 5, usually equal; stamens mostly 10, in some species only 5; styles 2; fr. a 2-beaked or 2-divided capsule, or sometimes the capsules nearly or quite separate at maturity, with numerous seeds. See Engler, "Monographie der Gattung Saxifraga," 1872.

Saxifrages are various in habit and stature, but they are mostly low and spreading with rosulate or tufted root-leaves. Most of the species in cultivation are grown as rock-garden plants, although the large-leaved members of the Megasea or Bergenia section are sometimes used as border plants. Owing to the small attention given to rock and alpine gardening in America, the Saxifrages are little known to our horticulturists. Most of them are abundantly hardy as to frost, but are likely to suffer from the dryness and heat of the American summer. Partial shade in summer is essential for the best results with most of the species. In winter the stools should be given ample covering of leaves. The most useful kinds for this country are the species of the Megasea section. These are low plants of bold habit, and are admirably adapted for rockwork and for spring forcing under glass. Fig. 1047, Vol. II, shows a clump of these plants in the lower left-hand corner.

The alpine species are mostly dwarf plants with more or less persistent foliage. Some of them, as *S. oppositifolia*, make dense moss-like mats; others, of which *S. Aizoon* may be taken as a cultural type, produce a dense rosette of leaves at the surface of the ground, from which arises a flower-scape. Some of these forms are very interesting because of the vari-colored or silvery effect produced by natural incrustations of lime on the leaves, particularly on the leaf-edges. Give shade.

Most Saxifrages make stolons and offshoots freely, and by these the plants are easily propagated; they are also increased by division. Some make bulblets.

The number of species of Saxifrage worthy of cultivation in rockeries and in borders is large, but the following account comprises those known to be in the trade in North America. Very few of the species have been modified to any extent under domestication. There are a number of important hybrids, two of which are in the American trade: *S. Andrewsii*, hybrid of *S. Geum* and *S. Aizoon*, is somewhat like the latter parent; fls. pale white with purple dots; lvs. spatulate to ligulate, very obtuse, crenulate-dentate; stem erect, few-leaved, glandular-hairy, 6–8 in. tall. *S. hybrida splendens* is perhaps a hybrid of *S. Geum* by *S. rotundifolia*.

INDEX.

aphylla, 30.
azoides, 26.
Aizoon, 12.
bronchialis, 27.
bryophora, 20.
cæspitosa, 29.
Camposii, 28.
cherlerioides, 27.
Chinensis, 33.
chrysantha, 16.
ciliata, 1.
cordifolia, 5.
Cotyledon, 11.
crassifolia, 4.
cuneifolia, 4.
Fortunei, 33.
Geum, 32.
granulata, 13.
hirsuta, 32.
Hostii, 10.
Huetiana, 7.
integrifolia, 25.
Japonica, 33.
Lantoscana, 9.
leptophylla, 30.
leucanthemifolia, 21.
ligulata, 1.
lingulata, 9.
Mertensiana, 19.
Michauxii, 21.
Milesii, 3.
nivalis, 23.
oppositifolia, 8.
peltata, 15.
Pennsylvanica, 22.
punctata, 18.
purpurea, 5.
purpurascens, 6.
pyramidalis, 11.
Pyrenaica, 8.
recta, 12.
rivularis, 14.
rosularis, 12.
rotundifolia, 17.
rubra, 1.
sarmentosa, 33.
Schmidtii, 1.
Sibirica, 4.
speciosa, 1.
Stracheyi, 2.
superba, 8, 33.
Taygetea, 17.
tricolor, 33.
unguiculata, 2.
umbrosa, 31.
variegata, 31.
Virginiensis, 24.
Wallaceana, 28.

A. *Lvs. with many small punctate glands or dots on the surface, usually large and thick and the petiole sheathed at the base: plant acaulescent, with a thick rootstock.* Bergenia or Megasea.

B. *Margin of leaf conspicuously ciliate or apiculate-toothed.*

C. *Base of leaf distinctly cordate, although narrow*.... 1. **ligulata**

CC. *Base of leaf usually narrowed to the petiole*....... 2. **Stracheyi**

3. **Milesii**

BB. *Margin of leaf not ciliate but more or less undulate or crenate: lvs. not pubescent.*

C. *Scape and inflorescence glabrous*..................... 4. **crassifolia**

5. **cordifolia**

CC. *Scape and inflorescence pubescent*.................... 6. **purpurascens**

AA. *Lvs. without punctate dots or glands (sometimes pitted) on the face, usually not large nor with sheaths at base: rootstocks (if any) slender or short.* Saxifrage proper.

B. *Seeds spherical (Cymbalaria)*...................... 7. **Huetiana**

BB. *Seeds fusiform or oblong-obovate.*

C. *Apex and margin of leaves bearing a few distinct pores or impressed dots.*

D. *Arrangement of lvs. opposite*..................... 8. **oppositifolia**

DD. *Arrangement of lvs. alternate (best seen on flowering stems).*

E. *Leaf-margins reflexed, crenulate or nearly entire, more or less crustate with lime*......... 9. **lingulata**

10. **Hostii**

EE. *Leaf-margins spreading, serrate, sometimes both margins and upper face crustate* ...... 11. **Cotyledon**

12. **Aizoon**

CC. *Apex and margin of leaves without pores.*

D. *True stem all subterranean.*

E. *Plant propagating by means of subterranean bulblets produced on the very short-jointed caudex* .... 13. **granulata**

14. **rivularis**

EE. *Plant propagating by non-bulbiferous shoots.*

F. *Foliage peltate, large.* 15. **peltata**

FF. *Foliage not peltate, usually not large.*

G. *Petals yellow* ...... 16. **chrysantha**

GG. *Petals white (sometimes spotted).*

H. *Lower lvs. orbicular* .... 17. **rotundifolia**

18. **punctata**

19. **Mertensiana**

HH. *Lower lvs. cuneate, obovate or spatulate (ovate in No. 25).*

I. *Shape of petals lanceolate-acute, or narrower* .... 20. **bryophora**

21. **leucanthemifolia**

22. **Pennsylvanica**

II. *Shape of petals obovate or orbicular* ...... 23. **nivalis**

24. **Virginiensis**

25. **integrifolia**

DD. *True stem above ground, the plant propagating by evident stolons or offsets.*

E. *Petals all equal.*

F. *Pistil more or less adnate to the calyx-tube at its base.*

G. *Foliage stiff and withering rather than falling, not divided, the margin usually setose.* 26. **azoides**

27. **bronchialis**

GG. *Foliage herbaceous, undivided or lobed.* 28. **Camposii**

29. **cæspitosa**

30. **aphylla**

F. *Pistil free from the calyx-tube* .... 31. **umbrosa**

32. **Geum**

EE. *Petals unequal, the two lower ones much larger than the others* .... 33. **sarmentosa**

1. **ligulàta**, Wall. (*S. Schmídtii*, Regel). Strong-growing plant, with large radical lvs. 3–8 in. across and orbicular or obovate in outline and cordate at base, the margin scarcely undulate but ciliate: scape becoming about 1 ft. tall, this and the pedicels and calices glabrous: fls. white to light purple, orbicular and clawed: fr. subglobose, drooping. Himalayan region. B.M. 3406, "the sepals too acute and the leaves too undulate," according to Hooker. L.B.C. 8:747. R.H. 1868:271. —Not perfectly hardy at Boston. By error, the name is sometimes written *S. lingulata*, a name which properly belongs to a very different species (No. 9). Var. **rùbra**, Hort., is a form with red-purple fls. Var. **speciòsa**, Hort., has showy blush or rose-white fls.

Var. **ciliàta**, Hook. (*S. ciliàta*, Royle), has lvs. hirsute on both sides and the margins strongly ciliate. B.M. 4915. G.C. III. 5:365.

2. **Stràcheyi**, Hook. f. & Thom. (*S. unguiculàta*, Hort., not Engl.). Fig. 2258. Habit of *S. ligulata:* lvs. glabrous on both sides, obovate, usually not at all cordate at base, the margin ciliate and from crenate-serrate to nearly entire: pedicels and calices pubescent, the scape becoming 1 ft. or more tall: fls. white or rose (sometimes yellow?), the calyx-teeth oblong and often wider above their base: fr. ovate-lanceolate, usually erect. Kashmir, 8,000–14,000 ft. B.M. 5967?. B.R. 29:65 (as *S. ciliata*). G.M. 39:233. J.H. III. 32:281.

2258. Saxifraga Stracheyi (× ¼).
As the flowers are appearing in earliest spring.

3. **Milesii**, Leichtl. (*S. Stràcheyi*, var. *Mìlesii*, Hort.). From *S. Stracheyi* it differs in having longer lvs. (9–12 in. long and 4–5 in. broad), white fls., oblong calyx-lobes, the petals distinctly clawed: corymb dense. Himalaya.

4. **crassifòlia**, Linn. (*S. cuneifòlia*, Hort., not Linn. *S. Sibírica*, Hort., not Linn.). Fig. 2259. Strong-growing species with woody rhizome: lvs. obovate to long-obovate, narrowed at the base, undulate-crenate: scape and inflorescence glabrous: fls. lilac or purplish, numerous on the inclined or drooping branches of the elevated panicle (scape 10–16 in. tall). Altai to Mongolia. B.M. 196. G.M. 34:67. Mn. 10, p. 74.

5. **cordifòlia**, Haw. Very like the above and probably only a form of it; differs in having broader, round-oblong, and more or less cordate lvs. Altai. Var. **purpùrea**, Hort., has purple fls.

6. **purpuráscens**, Hook. f. & Thom. Lvs. broad-obovate to short-oblong, the margins entire or slightly undulate, somewhat cordate at base: scape 12 in. or less high, bright purple, hairy: fls. deep purple, nodding, the calyx-lobes very obtuse: fr. elliptic-lanceolate, erect. Sikkim (India), 10,000 to 15,000 ft. altitude. B.M. 5066. —Very handsome because of its purple scape and flowers.

7. **Huetiàna**, Boiss. Annual or biennial, but grown from seed as a hardy garden annual and used for edgings and borders of small beds: dwarf, about 6 in. high, compact in growth: lvs. reniform and shallowly 5–7-lobed, the lobes obtuse or short-apiculate, long-petioled, bright green in color: fls. small but very numerous, long stalked in the axils, bright yellow, the petals ovate or oblong: seeds small, tuberculate. Asia Minor.—Very effective little plant.

8. **oppositifòlia**, Linn. Stem or caudex perennial and leafy, the branches rising 6 in. high and bearing many small persistent thick sedum-like lvs., and giving a moss-like aspect to the plant; sterile shoots with lvs. imbricated in four series: fls. solitary on the ends of the annual leafy shoots, lilac or white, the obovate petals exceeding the stamens. Rocks, alpine and boreal parts of Europe and North America, extending into northern Vermont. L.B.C. 9:869.—An excellent little rock plant, making a sedum-like mat, the foliage of a purplish cast. There are several cultivated forms, as var. **álba**, fls. white; var. **màjor**, fls.

2259. Saxifraga crassifolia.

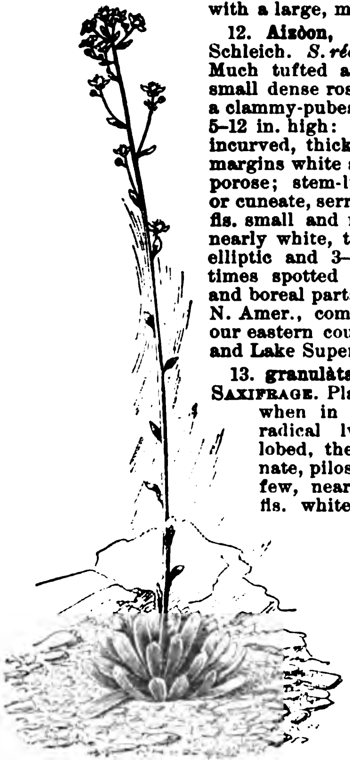
large, lilac; var. **Pyrenàica** (or *superba*), fls. very large, rose-purple. *S. oppositifolia* is evergreen. It makes a good carpet under other plants.

9. **lingulàta,** Bell. Radical lvs. in a rosette, numerous, linear-spatulate and somewhat acute, sulcate above, the margin erose-crenulate and somewhat ciliate and crustate with lime; stem-lvs. shorter, the margin cartilaginous and less crustate: scape rising 1–2 ft., erect or flexuose, and bearing a thyrsoid panicle of small white fls. with obovate or oblong-obovate 3-nerved petals. Apennines and Alps.

Var. **Lantoscàna,** Engler (*S. Lantoscàna*, Boiss. & Reut.). Lvs. short, more or less attenuate below, but not at the apex, the margin thin. Maritime Alps. G.C. II. 15:109.

10. **Hòstii,** Tausch. Radical or basal lvs. many, somewhat erect, flat above and the apex obtuse, ciliate at the base; stem-lvs. oblong and nearly or quite obtuse, crenate-serrate: corymb 5–9-fld., the fls. white or the oblong petals somewhat purple-spotted. Apennines and Alps.

11. **Cotylèdon,** Linn. Tufted, the basal lvs. forming attractive silvery rosettes, and sending up long panicles to a height of 1–2 ft.: basal lvs. lingulate to long-obovate, short-apiculate, plane, margin cartilaginous and dentate and bearing many pores; stem-lvs. lingulate-lanceolate: fls. numerous, white, the petals cuneate-obovate and 3–5-nerved and the middle nerve usually bifid, the calyx glandular. Mountains of Eu. Var. **pyramidàlis,** DC., is a robust form, with a large, many-fld. panicle.



2260. Saxifraga Aizoon (× ½).

12. **Aizòon,** Jacq. (*S. rosulàris*, Schleich. *S. récta*, Lap.). Fig. 2260. Much tufted alpine plant, forming small dense rosettes and sending up a clammy-pubescent, many-fld. scape 5–12 in. high: basal lvs. spatulate, incurved, thick and persistent, the margins white and cartilaginous and porose; stem-lvs. smaller, spatulate or cuneate, serrate towards the apex: fls. small and many, cream color to nearly white, the petals obovate to elliptic and 3–5-nerved, and sometimes spotted at the base. Alpine and boreal parts of Europe, Asia and N. Amer., coming as far south, in our eastern country, as northern Vt. and Lake Superior.—Very variable.

13. **granulàta,** Linn. MEADOW SAXIFRAGE. Plant erect and branched when in bloom, 6–20 in. tall: radical lvs. reniform, incise-lobed, the lobes entire or crenate, pilose, stalked; stem-lvs. few, nearly sessile, cuneate: fls. white, somewhat bell-shaped, more or less drooping, about 1 in. across, the petals obovate-oblong and much contracted at the base and 3-nerved. Eu., N. Afr., Asia.—This is a common Meadow Saxifrage of Europe, blooming early in May. It is an attractive plant. A full double form is in cultivation, being prized for planting in moist shady borders. Not hardy at Boston.

14. **rivulàris,** Linn. Matted little plant, with stems ascending 1–3 in. high: lower lvs. round-reniform, prominently 3–5-lobed, long-stalked; stem-lvs. narrow-ovate to lanceolate, entire: fls. 3–5, white, the petals ovate. Eu., Asia, N. Amer., in this country occurring as far south as the White Mts. and Colo.

15. **peltàta,** Torr. UMBRELLA PLANT. Strong plant, sending up large peltate leaf-blades or petioles 1–3 ft. long, the many pinkish or white fls. borne on long hairy scapes overtopping the young foliage: rootstock stout, horizontal: lvs. orbicular, much lobed or cut, almost centrally peltate: fls. ½ in. across, the petals elliptic and obtuse. Margins of streams, Calif. B.M. 6074. F. S. 23:2441. G.C. III. 27:139. Gn. 26, p. 545; 55, p. 6. Gng. 7:307.—One of the largest of all Saxifrages, and the only one with peltate lvs. The lf.-blade often measures 1 ft. across, and the rhizome 2–3 in. thick. The fls. appear in advance of the lvs. in early spring. Hardy in Mass., with slight protection, and a most desirable plant when bold effects are desired.

16. **chrysántha,** Gray. Dwarf cespitose plant with creeping shoots and rosulate, imbricated oblong-ovate, glabrous and fleshy lvs.: flowering stems 1–2 in. tall, filiform, glandular-pubescent, 1–3-fld., the oval petals yellow. Mts. of Colo.—Has been offered by dealers in native plants.

17. **rotundifòlia,** Linn. Root-lvs. thick, cordate-orbicular, dentate-lobed, long-stalked, clustered, but not rosulate; stem-lvs. nearly sessile, often narrower: fl.-stems 1 ft. tall, erect and somewhat branched, hairy: fls. white, the oblong-elliptic petals spotted with purple. Eu. and Asia. B.M. 424.—A very pretty plant for moist places.

Var. **Taygetèa,** Engler (*S. Taygetèa*, Boiss. & Heldr.). Basal lvs. very long-stalked, reniform or nearly orbicular, 5–9-lobed: fls. only 1–2 on the ends of the branches (several in *S. rotundifolia* itself). Greece.

18. **punctàta,** Linn. Plant 1 ft. or more high when in flower, more or less pubescent, the scape leafless: lvs. at first pubescent but becoming glabrous, reniform, equally and strongly dentate or crenate: fls. white, not punctate, the petals obovate or oblong; the sepals acutish. Asia and boreal N. Amer.

19. **Mertensiàna,** Bong. Very like *S. punctata*, but the lvs. incise-lobed and the lobes 3-toothed: sepals obtuse. Alaska.

20. **bryóphora,** Gray. Dwarf, the scapes about 3 in. high and branching: lvs. 1 in. or less long, oblanceolate to narrow-oblong, entire and ciliate, usually rosulate: scape leafless, the branches 1-fld.: petals lance-ovate, white, 2-spotted at the base. Mt. Dana.—Once offered by dealers in native plants.

21. **leucanthemifòlia,** Michx. (*S. Michaùxii*, Britt.). Viscid plant 5–20 in. tall, much branched, bearing many small star-like white fls. and long-spatulate toothed lvs.: petals lanceolate, unequal, the 3 larger ones cordate at the base and with a pair of yellow spots. Va. to Ga., in the mountains.

22. **Pennsylvánica,** Linn. Tall stout herb, sometimes 3 ft. and more high, viscid pubescent, nearly or quite simple: basal lvs. sometimes nearly 1 ft. long, oblanceolate, obscurely toothed, much narrowed below, the scape nearly naked: panicle long and becoming open: fls. numerous and small, greenish, the petals linear-lanceolate. Swamps, eastern U. S., south as far as Va. —Recommended as a bog plant.

23. **nivàlis,** Linn. Dwarf, the flowering branches rising 3–6 in.: lvs. ovate or obovate, thickish, crenate, narrowed into a petiole: fls. capitate on a naked scape, the head sometimes branched, white, the oblong or obovate petals persistent. Alpine and arctic regions of Eu., Asia and N. Amer. In the Rocky Mts. it occurs as far south as Arizona.

24. **Virginiénsis,** Michx. Low, viscid pubescent plant, 1 ft. or less tall, from a rosette of obovate or spatulate, crenate-toothed thickish lvs., which are narrowed into a petiole: cyme small and close at first but becoming loose and open: fls. small but many, dull white, the petals oblong-obtuse. On rocks and in woods, eastern U. S. as far south as Va. and Tenn.—A pretty spring flower, and sometimes planted. There is a double-fld. form.

25. **integrifòlia,** Hook. Plant a foot or less tall, viscid pubescent, leafless except at the base, the short caudex somewhat woody: lvs. ovate and very obtuse, entire or very nearly so: fls. white, small, in a more or less loose panicle, the petals obovate and twice the length of the spreading-reflexed calyx-lobes. Calif. northward.—Once offered amongst native plants.

26. **azoides,** Linn. Tufted plant, 6 in. or less tall, glabrous except for the sparingly setose leaf-margins: lvs. linear-lanceolate, somewhat fleshy, scattered along the stem: fls. solitary on axillary pedicels near the top of stem, yellow and more or less spotted with orange, the petals oblong. Eu., Asia, N. Amer., in the U. S. occurring in northern New England, northern New York, northern Mich., Rocky Mts., etc.

27. **bronchiàlis,** Linn. Dwarf and cespitose, the scape a few inches high and nearly leafless but leafy at the base: lvs. linear to linear-lanceolate, mucronulate at the apex, ciliate or spinulose on the margin, stiffish: fls. solitary or corymbose, on long and weak peduncles, yellowish white with orange-red dots, the petals obovate-oblong. Asia and arctic N. W. America and Rocky Mts. Only var. **cherlerioides,** Engler (*S. cherlerioìdes*, Don), has appeared in the Amer. trade: very dwarf, only 2 or 3 in. high, densely cespitose, few-flowered, the lvs. short and somewhat spatulate. Asia and Alaska.

28. **Campòsii,** Boiss. & Reut. (*S. Wallaceàna*, Hort.). Tufted and bright green, with reddish fl.-stems, hairy and somewhat glandular: lvs. spatulate, with an abruptly enlarging end, 3–5-lobed, and sometimes again toothed: fl.-stems branching, 3–4 in. high, erect: fls. ¾ in. across, white, somewhat bell-shaped, the broad petals much exceeding the calyx. Spain. B.M. 6640. Gn. 35, p. 392. A.F. 4:493.—Once introduced here, but does not endure the hot climate well. An attractive species.

29. **cæspitòsa,** Linn. Exceedingly variable species: dwarf and cespitose, the fl.-stems erect and nearly leafless and somewhat glandular-pilose (3–4 in. high): lvs. usually cuneate but sometimes nearly linear, usually 3-fid and sometimes 5-fid, the lobes linear and obtuse and nearly parallel: fls. few, white, 1–10 in a raceme or panicle, campanulate, the petals spreading, oblong and obtuse, 3-nerved. Eu.

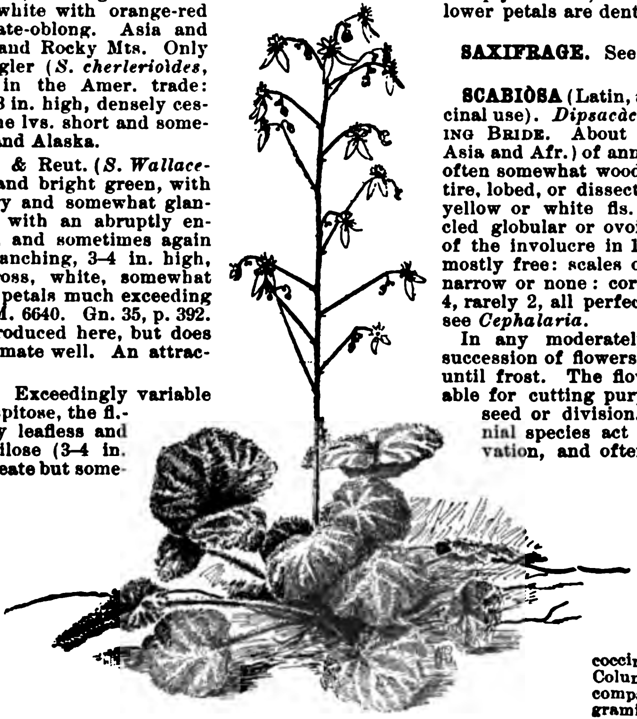
30. **aphỳ'la,** Sternb. (*S. leptophýlla*, Frœl.). Small, loosely cespitose species, producing many or several rosettes at the surface of the ground, and sending up short, almost leafless, 1-fld. or 2-fld. glandular scapes: lvs. thinnish, entire or 3–5-lobed: fls. light yellow, the petals linear and acute and about as long as the calyx-lobes. Eu.

31. **umbròsa,** Linn. LONDON PRIDE. ST. PATRICK'S CABBAGE. Erect-growing plant, the nearly leafless branching fl.-stems reaching 6–12 in. high and springing from a dense rosette of lvs. 6–12 in. across: lvs. thick and mostly glabrous, obovate, crenate-dentate, the stalk-like base ciliate: fls. small, pink, with darker spots, in a loose panicle, the petals ovate or oblong and spreading. Eu., in shady places.—A very neat and attractive plant, frequent in European gardens, but rarely seen here. There is a var. **variegàta,** Hort.

32. **Geum,** Linn. (*S. hirsùta*, Linn.). Differs from *S. umbrosa* in being hairy, in having orbicular lvs. that are cordate or notched at the base and on long stalks. Range of last, and said to occur in Newfoundland.

33. **sarmentòsa,** Linn. (*S. Japónica*, Hort. *S. Chinénsis*, Lour.). STRAWBERRY GERANIUM. In England known as MOTHER OF THOUSANDS, a name also applied to *Linaria Cymbalaria*. OLD MAN'S BEARD. Fig. 2261. True stem or caudex scarcely rising above the ground, but the fl.-stems rising 1–2 ft. and much branched, whole plant sparsely hairy: stolons many, long and rooting freely at the joints after the manner of a strawberry: lvs. nearly orbicular, shallowly crenate-lobed, the lobes apiculate, all radical and long-stalked: fls. many, white, the 2 lower hanging petals lanceolate pointed or lance-ovate, the 3 upper ones small and inconspicuous and pinkish and spotted. Japan and China. B.M. 92. G.C. III. 7:237 (showing irritability of plant to light). Gn. 30, p. 363; 32, p. 37. R.H. 1876, p. 427.—An old-time greenhouse plant, and also one of the commonest window-garden subjects. Of easiest culture. Var. **tricolor,** Sieb. (*S. tricolor supérba*, Hort.), has lvs. handsomely marked with creamy white and red variegations. F.S. 21:2227–8 (as *S. Fortunei tricolor*). *S. Fortunei*, Hook. (B.M. 5377), is a closely allied species, but is less (if any) sarmentose, the lvs. are more sharply toothed, the fls. are white and the lower petals are dentate.

L. H. B.



2261. Saxifraga sarmentosa (× ⅛).

SAXIFRAGE. See *Saxifraga*.

SCABIÒSA (Latin, *itch*; referring to medicinal use). *Dipsacàceæ*. SCABIOUS. MOURNING BRIDE. About 52 species (from Eu., Asia and Afr.) of annual or perennial herbs, often somewhat woody at the base, with entire, lobed, or dissected lvs. and blue, rose, yellow or white fls. in mostly long-peduncled globular or ovoid-conic heads. Bracts of the involucre in 1 or 2 rows, foliaceous, mostly free: scales of the receptacle small, narrow or none: corolla 4–5-cleft: stamens 4, rarely 2, all perfect. For a related plant, see *Cephalaria*.

In any moderately good garden soil a succession of flowers is produced from June until frost. The flowers are very serviceable for cutting purposes. Propagated by seed or division. Many of the perennial species act like biennials in cultivation, and often flower the first year from seed. *S. atropurpurea* is a common garden annual.

INDEX.

alba, 3, 7.
arvensis, 2.
atropurpurea, 4.
brachiata, 6.
candidissima, 4.
Caucasica, 7.
coccinea, 4.
Columbaria, 3.
compacta, 4.
graminifolia, 8.
major, 4.
nana, 4.
ochroleuca, 1.
perfecta, 7.
pumila, 4.
stellata, 5.
varia, 2.
Webbiana, 1.

A. *Radical leaves dentate or lobed.*
  B. *Fls. yellow*........................1. **ochroleuca**
  BB. *Fls. dark purple, blue or white.*
    C. *Calyx-limb sessile or nearly so.*
      D. *Lvs. sessile*................2. **arvensis**
      DD. *Lvs. petioled*...............3. **Columbaria**
    CC. *Calyx-limb pedicellate.*
      D. *Plant 2 ft. high*.............4. **atropurpurea**
      DD. *Plant 6–18 in. high*.........5. **stellata**
AA. *Radical lvs. entire.*
  B. *Lvs. ovate-oblong*................6. **brachiata**
  BB. *Lvs. lance-linear to linear.*
    C. *Heads 3 in. across*.............7. **Caucasica**
    CC. *Heads smaller*.................8. **graminifolia**

1. **ochroleùca,** Linn. A hardy perennial herb about 18 in. high: stem branching and somewhat hairy: lvs. whitish pubescent, the radical crenate or lyrately pinnatifid, tapering to a petiole, pubescent on both sides; those of the stem 1–2-pinnately divided or cleft into oblong or linear lobes: peduncles long, slender: lvs. of the involucre shorter than the fls. June to autumn. Eu. and Asia. Var. **Webbiàna** (*S. Webbiàna*, D. Don). Height 6–10 in.: lower lvs. canescent-villous, the upper glabrous. Resembles the type but is smaller in all its parts. B.R. 9:717.

2. **arvénsis,** Linn. (*S. vària*, Gilib.). A hardy perennial 2–4 ft. high: stem hispid: lvs. villous-hirsute, the radical unequally pinnately parted, the lobes lanceo-

late; those of the stem pinnately divided with linear lobes, the upper linear-lanceolate: involucral bracts obtuse: fls. lilac or blue, 1–2 in. across. June–Aug. Not known to be in the trade, *S. varia*, Hort., being presumably mixed varieties of *S. atropurpurea*.

2262. Scabiosa atropurpurea (× ⅓).

3. **Columbària**, Linn. A hardy perennial quite variable in character, 2 ft. high: stem branching, glabrous or nearly so: radical lvs. ovate-obtuse, crenate, membranous, pubescent on both sides; stem-lvs. glabrous, pinnately parted, the segments linear, entire or slightly incised: fls. blue, in ovate-globular heads on long pubescent peduncles. June–Sept. Eu., Asia, Afr.—Var. **álba** is cult.

4. **atropurpùrea**, Linn. (*S. màjor*, Hort.). Sweet Scabious. Fig. 2262. An annual branching plant about 2 ft. high: radical lvs. lanceolate-ovate, lyrate, coarsely dentate; stem-lvs. pinnately parted, the lobes oblong, dentate or cut: fls. dark purple, rose or white, in long-peduncled heads, becoming ovate or oblong in fr. July–Oct. S. Eu. Gn. 21, p. 118. B.M. 247. F.S. 12:1203. —Vars. **candidíssima, coccínea, compácta, màjor, nàna** and **pùmila** are often offered as if they were distinct species, as *S. nana*, etc.

5. **stellàta**, Linn. An annual plant, hairy, simple or somewhat branched, 6–18 in. high: lvs. cut or somewhat lyrate, the terminal lobe large, obovate, dentate, the upper ones often pinnately parted: fls. blue, in long-peduncled heads; corolla 5-cleft, the lobes radiate. June and later. S. Eu.

6. **brachiàta**, Sibth. & Sm. An annual species about 1 ft. high: lower lvs. ovate-oblong, the upper pinnately cut, lyrate; the lower lobes decurrent, the terminal large, obovate, oblong: fls. light blue. June and later. Eu., Asia.

7. **Caucásica**, Bieb. A hardy perennial 18 in. high: lvs. glaucous or whitish, the lower lanceolate-linear, acute, the upper cut and divided: heads flattish: fls. light blue. June–Oct. Caucasus Mts. Gn. 35, p. 121. —Vars. **álba** and **perfécta** are also offered. G.M. 38:839.

8. **graminifòlia**, Linn. A perennial herb, somewhat woody at the base, about 1 ft. high: lvs. linear, silvery: fls. pale blue. June–Oct. Eu. B.R. 10:835.

J. B. Keller and F. W. Barclay.

SCABIOUS. For Common Scabious, see *Scabiosa*. For Shepherd's or Sheep Scabious, see *Jasione perennis*.

SCALLION, a name for the Shallot; also used for onions that do not make good bulbs but remain with thick necks, but generally pronounced and written *scullion* in this country. The word is connected with *Ascalonicum* (*Allium Ascalonicum*).

SCÁNDIX (Greek, *to sting;* in reference to the roughness of the fruit). *Umbelliferæ*. About 10 species of annual herbs mostly natives of Europe: lvs. pinnately decompound, the segments small and narrow: fls. white, polygamous, often radiate, usually in few-rayed compound or simple umbels: fr. oblong-linear, long-beaked, the ridges obtuse, prominent.

Pécten-Véneris, Linn. Fig. 2263. A hardy garden annual 6–12 in. high, with finely cut lvs. and small white fls. in simple umbels. Eu.—Little grown here.

S. cerefòlium, Linn. See Chervil.

F. W. Barclay.

SCAPHOSÈPALUM (Greek, *boat* and *sepal;* alluding to the form of the lower sepal). *Orchidàceæ*. A genus recently separated from Masdevallia upon the character of the lateral sepals, which are united into a boat-shaped organ. In habit the plants resemble Masdevallia, except that the parts of the rhizome are longer, thus making the tufts less compact, and the racemes assume climbing habits, becoming very long and bearing fls. for months in succession. The dorsal sepal is free or nearly so: labellum and sepal small. The genus contains about 10 species.

Grow in a coolhouse well protected from the sun. Keep the summer temperature as low as possible. Give plenty of water when growing. When at rest, water sparingly but do not allow the plants to become entirely dry. Use as small a pan as possible. The culture is like that for Masdevallia.

gibberòsum, Rolfe (*Masdevállia gibberòsa*, Reichb. f.). Lvs. 3–5 in. long, oblong-obovate or lanceolate, obtuse: peduncle 6–10 in. long, warty, bearing a loose raceme of 4–8 fls.: dorsal sepal boat-shaped, with a long tail, dull red, with strong, greenish ribs; lateral sepals partly connate in a concave lamina, then spreading horizontally, yellow, spotted with red and ending in yellowish tails. Colombia. B.M. 6990.

2263. Scandix Pecten-Veneris (× ⅓).

punctàtum, Rolfe (*Masdevállia punctàta*, Rolfe). Densely tufted: lvs. elliptic-lanceolate, subacute, 3–5 in. long: peduncles pendulous: fls. small, dull yellowish, thickly speckled with crimson; dorsal sepal broadly ovate, concave, strongly 5-ribbed, ending in a stiff incurved tail; lateral sepals spreading horizontally, falcately incurved, with a filiform process near the tip. Colombia. B.M. 7165.

Heinrich Hasselbring and Wm. Mathews.

SCARBOROUGH LILY. *Vallota purpurea.*

SCARLET BUSH. *Hamelia.*

SCARLET LIGHTNING. *Lychnis Chalcedonica.*

SCARLET PLUME. *Euphorbia fulgens.*

SCARLET RUNNER. A red-flowered variety of *Phaseolus multiflorus.*

SCENTED VERBENA. A name found in some books for the Lemon Verbena. See *Lippia.*

SCHAUÈRIA (after J. C. Schauer, professor at Greifswald, 1813–1848). *Acanthàceæ.* Erect, half-shrubby herbs, with entire lvs.: fls. yellow or red, in a terminal thyrse or spike; calyx 5-parted, segments linear or setaceous; corolla-tube long, gradually broadened upward; limb 2-lipped, the upper lip interior narrow, entire or emarginate, erect, lower lip cut into 3 subequal, recurved segments; stamens 2 each, with 2 parallel anthers, about as long as the upper lip; aborted stamens wanting; style filiform: ovary seated on a disk, 2-loculed, with 2 seeds in each locule. About 8 species from Brazil. Closely related to Jacobinia, from which it differs by the equal parallel anther cells. It is distinguished from Anisacanthus by its setaceous calyx-lobes, and from Fittonia by its habit.

flavicoma, N. E. Brown (*Justícia flàva*, Hort., not Kurz.). Fig. 2264. Half-shrubby plants, with erect, branched stems, up to 4 ft. high: lvs. opposite, petiolate, ovate to ovate-lanceolate, shining green, undulate: fls. light yellow, 1⅛ in. long, borne in erect, feathery panicles; calyx-lobes long, subulate, glandular-hairy, persistent after the corolla has fallen. Autumn. Brazil. B.M. 2816 (as *Justicia calycotricha*). B.R. 12:1027 (as *Justicia flavicoma*). L.B.C. 20:1921 (as *Justícia callitricha*).—This plant has been confused with *S. calycótricha*, Nees, and has long been cultivated under that name. *S. calycótricha*, Nees, has a smooth calyx and broader ovate lvs. which are very obtuse or subcordate at the base.

Heinrich Hasselbring.

SCHEÈLEA (after Scheele, distinguished German chemist). *Palmàceæ.* About 10 species of pinnate palms from tropical South America. They are spineless, tall or dwarf: leaf-segments arranged in regular series or grouped, linear, in young plants unequally and obtusely 2-cut at the apex: fls. yellowish, diœcious or monœcious, the males very numerous in the upper part of the branches, the females few or solitary in the lower part and sometimes peduncled; petals of the males long-club-shaped or cylindrical; stamens 6, shorter than the petals: fr. 1–3-seeded.

butyràcea, Karst. This species is cult. in S. Calif. Franceschi remarks that it comes from Venezuela and is a magnificent palm with the habit of Attalea. H. A. Siebrecht writes that it is rare in cultivation and that it is more interesting than beautiful. On account of its large stem base or crown, it requires so large a pot or tub for the size of the plant that it does not make a very ornamental subject.

W. M.

SCHEÈRIA (Frederick Scheer presented the original species to the Royal Botanic Gardens at Kew, he having received them in 1850, through J. Potts, from Chihuahua, Mexico). *Gesneràceæ.* A name proposed for four Mexican and tropical American herbs which are now referred to Achimenes (which see). From Achimenes, Seeman, its founder, distinguished it "by its truly infundibuliform, not bilobed, stigma." In habit, the genus suggests *Achimenes hirsuta*, *A. pedunculata* and *A. multiflora* (see p. 18, Vol. I). In the American trade one species is offered, **S. Mexicàna,** Seem. (*S. cæruléscens*, Hort.), now more properly known as *Achimenes Scheerii*, Hemsl. Stem erect, hairy: lvs. ovate, hairy, dentate, stout-stalked, opposite: fls. solitary in the axils, stalked, the corolla 2–2½ in. long, the tube inclined or drooping and curved, the wide-spreading 5-lobed limb blue-purple. Lvs. with a metallic luster. B.M. 4743.

L. H. B.

2264. Schaueria flavicoma (× ⅛).
Chiefly known to the trade under the name of *Justicia flava.*

SCHÌMA (said to be an Arabian name). *Ternströmiàceæ.* About 9 species of tender evergreen trees and shrubs, with 5-petaled white fls. about 1⅛ in. across. Here belongs a neat little tea-like shrub about 2 ft. high, known to the trade as *Gordonia Javanica.* Schima and Gordonia are closely related genera, distinguished by Bentham and Hooker as follows: Schima has inferior radicles, sepals scarcely unequal, ovules few in each locule and laterally affixed; Gordonia has superior radicles, sepals markedly unequal, ovules numerous in each locule and pendulous.

Other generic characters of Schima: peduncles 1-fld., usually erect: fls. solitary, in the axils or the upper ones crowded in a short raceme; petals connate at the base, imbricate, concave; stamens numerous: ovary 5-celled (rarely 4- or 6-celled); stigmas broad and spreading: capsule woody: seeds flat, kidney-shaped.

Norónhæ, Reinw. (*Gordònia Javánica*, Roll.). Tender evergreen shrub, 2 ft. high or perhaps more, branched, glabrous: lvs. alternate, elliptic-lanceolate, coriaceous, entire: fls. solitary in the axils, white, 1⅛ in. across, shorter than the lvs.; petals obovate. Java. B.M. 4539. —A good pot-plant for the warmhouse. Readily increased by cuttings.

W. M.

SCHÌNUS (Greek name for the Mastic-tree, *Pistacia Lentiscus;* applied to this genus on account of the resinous, mastic-like juice of some species). *Anacardiàceæ.* Resinous, diœcious trees, with alternate, pinnate lvs., sessile lfts., axillary and terminal bracteate panicles, small whitish fls. with short, 5-lobed calyx, 5 imbricated petals, broad annular disk, and 10 stamens: fr. a globose drupe. About 17 species, all South American except one in the Sandwich Islands, one in Jamaica and one in St. Helena. Only two are cultivated; they are semi-tropical and grown in the warmhouse at the East and in north Europe, in the open at the South and in Calif. as far north as the San Francisco Bay region.

Molle, the old generic name, is from Mulli, the Peruvian name of *S. Molle*, and not, as sometimes supposed, Latin *molle*, soft, which would not be applicable in this case.

Mólle, Linn. PERUVIAN MASTIC-TREE. CALIFORNIAN PEPPER-TREE. Figs. 2265, 2266. Evergreen tree, 20 ft. and more, with rounded outline and graceful, pendulous branchlets when not trimmed: lvs. 9 in. or more long, glabrous, of many alternate, linear-lanceolate lfts. 1⅛–2 in. long: fls. in conical panicles, yellowish white; ripe fruits the size of peppercorns (whence the popular, but misleading, Californian name), of a beautiful rose-color. Peru. G.F. 8:505. R.H. 1889, p. 225. G.C. III. 17:588, 589. Gn.25, p. 418. B.M. 3339.—In southern and middle California more extensively cultivated than any other ornamental tree except, perhaps, the Blue Gum (*Eucalyptus globulus*), and thriving best in the warm interior valleys, though hardy on the coast at San Francisco. Valued as a lawn and avenue tree; often planted as a street tree, for which, however, it is unsuited, being too spreading and branching too low. *Molle* was a generic name used by Tournefort, and placed in apposition with Schinus by Linnæus (explained above).

terebinthifòlius, Raddi, with racemose fls. and lvs. composed of seven broader, somewhat serrated lfts., is sparingly met with in cult. in S. Calif., and proves hardy in San Francisco. Brazil.

depéndens, Ortega (*Duvaùa depéndens*, DC.), is a shrub or small tree, with more or less drooping branches: lvs. ⅛–1 in. long, oblong or obovate: fls. yellow, 1 line long, produced in great numbers in racemes about as long as the leaves. Western S. Amer. B.M. 7406. B.R. 19:1568 (*Duvaua ovata*); 19:1573 (*D. dependens*); 29:59 (*D. longifolia*).—The genus Duvaua was distinguished from Schinus chiefly by its simple foliage, but it is now considered a subgenus of Schinus.

JOS. BURTT DAVY.

Schinus Molle is everywhere present in southern California, where it attains a height of 50 ft. and sows itself. It was a great thing for this region in years past before the water systems had reached their present efficiency. Now the poor Pepper-tree is under a ban, and justly so. Next to an oleander the black scale loves a Pepper-tree. Hence the Pepper-trees, being large and numerous, have been indirectly a serious menace to the orchards of citrous fruits. Thousands of old trees, 2–3 ft. in diameter, have been cut during the past year because of their proximity to orange orchards. At least one nurseryman has actually refused to sell Pepper-trees to people who ordered them. Los Angeles boasts some magnificent avenues of them. *S. terebinthifolius* is but little known in this region, the tallest tree being only 15 ft. as yet, but it is likely to be extensively planted in the near future.

ERNEST BRAUNTON.

SCHISMATOGLÓTTIS (Greek, *falling tongue*; referring to the fact that the limb of the spathe soon falls off). *Aràceæ*. The plants which bear this uncomfortable name are amongst the finest variegated foliage plants in the Arum family, and hardly if at all inferior in beauty and ease of culture to the popular Dieffenbachias, which they closely resemble. They are tender plants used for the decoration of warm conservatories, but they have been successfully grown by skilled amateurs in living houses, where a day temperature of 70° could be maintained throughout the winter. The genus contains about 15 species, mostly natives of the Malay Archipelago. They have stoloniferous rhizomes and the caudex lies on the ground. The leaves are large, ovate or lanceolate, banded or blotched with white or pale yellow. The brightness of the colors in variegated plants largely depends upon culture. Fls. unisexual; fertile males with 2–3 short stamens, truncate at the apex; sterile males with staminodes destitute of pollen: female fls. with 2–4 pistils: ovary 1-loculed; ovules anatropous: berries oblong, green, yellowish or scarlet. Engler in DC. Monog. Phaner. vol. 2, 1879. For culture, see *Dieffenbachia*. See also *Philodendron*, to which the genus is somewhat closely allied.

INDEX.

(S. L. refers to supplementary list.)

crispata, 3.
decora, 6.
immaculata, 1.
Lansbergiana, 1.
Lavalleei, 1.
Neoguineensis, 5.
picta, 4.
pulchra, 6.
purpurea, 1.
Roebelinii, S. L.
Seemanii, S. L.
Siamensis, S. L.
variegata, 2, 5.
Wittmaniana, 6.

2265. Schinus Molle, the California Pepper-tree.

A. *Lvs. lanceolate-oblong, base not heart-shaped.*
  B. *Petiole longer than blade*.......1. **Lavalleei**
  BB. *Petiole shorter than blade*......2. **variegata**
AA. *Lvs. ovate, base heart-shaped.*
  B. *Foliage banded with white.*
    C. *Petiole about as long as blade*..3. **crispata**
    CC. *Petiole twice as long as blade*..4. **picta**
  BB. *Foliage blotched with white.*
    C. *More green than white*.......5. **Neoguineensis**
    CC. *More white than green*.......6. **pulchra**

1. **Lavállleei**, Linden. Lvs. lanceolate or lanceolate-oblong, rounded or narrowed at the base but not cordate, blotched with silvery white, some of the blotches much larger than others; petiole 6–8 in. long; blade 5–7 x 1⅛–2¼ in.; sheath reddish. Malaya. I.H. 28:418.—Var. **immaculàta** (var. *Lansbergiàna*, Linden) differs in having purple sheaths and leaf-stalks, and foliage green above, dark wine-purple below. Var. **purpùrea** is a Sumatran form with foliage blotched gray above and dark wine-purple beneath.

2. **variegàta**, Hook. Lvs. oblong-lanceolate, obtuse or rounded at the base, long-cuspidate at apex, dark green above, marked whitish along the midrib; petiole 3–4 in. long or less than half the length of the blade. Borneo. This has been confused in the trade with *S. Neoguineensis*.

3. **crispàta**, Hook. Lvs. 5–7 in. long, leathery, ovate-cordate, with rounded basal lobes, dull green above with 2 whitish, irregular, nearly parallel bands extending from base to apex and about half-way between midrib and margin. Borneo. B.M. 6576.

4. **pícta**, Schott. Lvs. ovate-cordate, the basal lobes short, but the sinus deep, dark green above, marked with lacerated glaucous spots at the middle, on each side of the midrib and between the nerves; petiole 8–16 in. long; blade 6–7 in. long. Java.

5. **Neoguineénsis**, N. E. Br. (*S. variegàta*, Hort., not Hook.). Lvs. ovate-cordate, bright green, irregularly blotched with pale yellowish green, the total mass of green being greater than the variegation; petiole 9–12 in. long; blade 8–9 x 5–5¾ in. New Guinea. I.H. 27:380 as *Calocasia Neoguineensis*, the variegation being a bright creamy white.

6. **púlchra**, N. E. Br. (*S. décora*, Bull.). Lvs. ovate, obliquely cordate, irregularly blotched with silvery

white, the total mass of green being less than the variegation; petiole 3–4½ in. long; blade 4–5 x 1¾–2½ in. Borneo. I.H. 31:520. G.C. II. 24:361.—*S. decora*, var. *Wittmaniàna*, was offered in 1893 by John Saul, Washington, D. C.

S. Roébelinii, Pitcher & Manda, 1895, p. 138. "Lvs. beautifully marked with silvery white in a broad feathery variegation. Only the center and edge of the leaves are plain light green. The plant is compact, free-growing, with thick leaves as enduring as those of a rubber tree. A fine house plant." This plant is imperfectly known. It is figured in Pitcher & Manda's catalogue 1895:141 as S. Roebelinii, and the same thing is used in A.G. 19:589 (1898) as S. picta and in V. M. 23:71 (1899) as S. crispata. The plant so pictured is distinct from any species described above. There is more white than green in the leaf, only the edges and midrib portion being green. Some growers believe it to be a sport of S. crispata.—*S. Seèmanii*, Hort. Bull., was advertised by the U. S. Nursery Co. 1895, but seems unknown to botanists.—*S. Siaménsis*, Hort. Bull. still in cultivation, but imperfectly known to botany. Possibly a species of Aglaonema. W. M.

SCHIZÆA (Greek, *to split*). *Schizæàceæ.* A genus of small ferns with twisted grass-like lvs. and sedge-like sporophylls formed of a cluster of closely compacted pinnæ, each with two rows of sporangia, which in common with the family are pear-shaped, with an apical ring, opening by a vertical fissure.

pusílla, Pursh. Our only native species, growing in sand barrens mainly in New Jersey. Lvs. an inch long, grass-like: sporophylls 2–3 in. long, with 6–8 closely compacted divisions, forming a spike at the apex. Known locally as Curly-grass. The prothallus only recently studied is found to resemble protonema, being filamentous rather than thallose as in ordinary ferns.

L. M. Underwood.

2266. Foliage and fruit of California Pepper-tree—Schinus Molle (× ⅓).

SCHIZÁNDRA (Greek, *schizein*, to cleave, and *aner, andros*, man, stamen; referring to the cleft or separate anther-cells). Including *Sphæróstema* and *Maximowíczia*. *Magnoliàceæ.* Ornamental deciduous twining shrubs, with alternate, simple lvs., white, yellowish or red, not very conspicuous fls. on slender, drooping pedicels and showy scarlet or black, berry-like fr. in drooping racemes. The Asiatic *S. Chinensis* is hardy north, while the native *S. coccinea* can only be grown south. They may be used for covering rocks, trees, shrubs or fences, and seem to thrive best in partly shaded and somewhat moist places in a porous, sandy loam. Prop. by seeds, by greenwood cuttings under glass, root-cuttings or layers, and also by suckers. Six or 7 species, chiefly in E. Asia, from India to N. China and Japan, 1 species in N. America. Lvs. exstipulate, usually ovate: fls. slender-stalked, in few-fld. axillary clusters, diœcious or monœcious; sepals and petals 9–12, not differing; stamens 5–15, more or less connate; carpels numerous, imbricated in the fl., developing into berries disposed on the elongated filiform receptacle, forming a drooping raceme. The fruits of the Asiatic species are eaten in their native countries.

coccínea, Michx. High climbing shrub: lvs. slender-petioled, ovate or oval, acuminate, entire or obscurely denticulate, glabrous, 2–3½ in. long: fls. monœcious, crimson purplish, ⅓–½ in. across; stamens 5, connate into a 5-lobed disk with the anther-cells widely separated: berries scarlet, forming a loose raceme 2–3 in. long. June. S. C. to E. Tex. B.M. 1413.

Chinénsis, Baill. (*Maximowiczia Sinénsis*, Rupr.). Climbing to 25 ft.: lvs. broadly oval or ovate, acute or acuminate, remotely denticulate, dark green and shining above, glabrous except at the veins beneath, 2–4 in. long; petiole ½–1½ in. long: fls. diœcious, pinkish white, ½ in. across, fragrant; stamens 5, divided at the apex: berries scarlet, forming a rather dense raceme 1–4 in. long. May, June. Japan, N. China, Amurland. Gt. 12:382. F.S. 15:1594. Gn. 6, p. 583. M.D.G. 1899:568.—The very showy fruit ripens end of August; to secure it both sexes must be planted together.

S. nigra, Maxim. Similar to the preceding: lvs. smaller, quite glabrous: fls. white: fr. bluish black. Japan. Seems more tender than S. Chinensis.—*S. propínqua*, Hook. f. & Thom. (Sphærostema propinquum, Blume). Lvs. ovate to ovate-lanceolate, about 4 in. long on ½-in. long petioles: fls. pale yellowish: fr. scarlet, forming racemes to 6 in. long. Himalayas. B.M. 4614. For cult. in subtropical regions or in the warm greenhouse. Alfred Rehder.

SCHIZÁNTHUS (Greek, *split* and *flower;* from the incised corolla). *Solanàceæ.* Butterfly Flower. About 6 species of annual herbs from Chile, with mostly finely cut leaves and terminal open cymes of variously and highly colored fls.: calyx 5-cleft, the lobes linear, corolla tubular; limb wide-spreading, oblique, plicate, somewhat 2-lipped, laciniate; stamens 2, exserted: seeds numerous, small. These dainty plants are of easy culture in any good garden soil. They are also useful as pot-plants for spring flowering, the seed being sown in early fall and the plants kept in a light house and given plenty of root room as they need it.

A. *Corolla-tube as long as the calyx: stamens short-exserted.*

B. *The middle segment of the anterior lip of the corolla notched at summit.*

retùsus, Hook. Stem 2 ft. high: lvs. pinnatisect, with the segments entire, dentate or pinnatifid: fls. in the type deep rose, with the large middle segment of the upper lip orange except at the tip; the lateral segments of the posterior lip falcate, acute, linear, longer than the middle segment. B.M. 3045. B.R. 18:1544.—The portions of the flower which are rose-colored in the type are white in var. **álba**.

BB. *The middle segment of the anterior lip not notched at apex.*

Gràhami, Gill. Lvs. 1-2-pinnatisect; segments entire or dentately pinnatifid: fls. typically lilac or rose, with the middle half of the middle segment of the anterior lip yellow or orange; the lateral segments of the posterior lip falcate, linear, acute, shorter than the middle segment. B.M. 3044. R.H. 1843:529.

AA. *Corolla-tube shorter than the calyx: stamens long-exserted.*

pinnàtus, Ruiz and Pav. (*S. pórrigens*, Grah. *S. Prièstii*, Paxt.). Fig. 2267. The most variable of the species, with many horticultural forms distinguished by height of stem and color markings of the fls. Typically 2 ft. high: lvs. 1–2-pinnatisect; the segments entire, dentate or incisely pinnatifid: fls. varying in depth of color, the lower lip usually violet or lilac; the upper paler, its middle section with a yellow blotch at its base and spotted with purple or violet. B.M. 2404, 2521 (as *S. porrigens*). B.R. 9:725; 18: 1562 (as var. *humilis*).—Var. **nàna,** Hort., is somewhat lower-growing. Var. **níveus,** Hort., has pure white fls. Var. **oculàtus,** Hort., has a purplish black blotch surrounded with yellow at the base of the middle segment of the upper lip or with the typical yellow portion dotted with small dark purple spots. B.H. 1862: 451. Var. **papilionàceus,** Hort., has a central coloring somewhat as var. *oculatus*, with the general color of the flower marbled in various shades. Var. **tigridioides,** Hort., is also cultivated.

F. W. Barclay.

2267. Schizanthus pinnatus (× ½).

SCHIZOCÒDON (Greek, *cut bell;* referring to the fringed corolla). *Diapensiàceæ.* *Schizocodon soldanelloides* is a pretty alpine plant from Japan with rosy flowers fringed like the well-known Soldanellas of the Alps. It may be readily distinguished from Soldanella (which is a member of the primrose family) by the leaves being toothed, and the stamens 4 instead of 5. The name "Fringed Soldanella" has been proposed for Schizocodon, but all Soldanellas are fringed. "Fringed Galax" would be better, as Galax is the nearest relative, Schizocodon being, in fact, the Japanese representative of the American Galax. The leaves of Schizocodon are sometimes more or less bronzy, like those of Galax, but their form is not so pleasing. The plant is only a few inches high, and the fls. are borne to the number of 4–6 on a scape. The scapes are numerous and the fls. about 1 in. across. Since 1892 this plant has excited an amount of interest comparable to that caused by the introduction of Shortia, in 1889.

Schizocodon is distinguished from allied genera by the following characters: corolla funnel-shaped, 5-lobed, the lobes fimbriate; stamens affixed between the lobes of the corolla, and separate from the staminodes, which are long and linear. Other characters: ovary 3-loculed: capsule globose, 3-cornered, loculicidally 3-valved: seeds numerous.

soldanelloides, Sieb. & Zucc. Fringed Galax. Fig. 2268. Hardy, tufted, alpine plant a few in. high: lvs. leathery, evergreen, long-stalked, the blade roundish, wedge-shaped or subcordate at the base, coarsely toothed, the teeth apiculate: fls. nodding; sepals 5, oblong, obtuse; corolla deep rose in center passing into blush or white at the edges; staminodes linear. Japan. B.M. 7316. Gn. 44:934. G.C. III. 13:415. G.M. 36:206. J.H. III. 34:323. V. 20:119.—This is probably the only species in the genus, as *S. uniflorus* is Shortia and *S. ilicifolius* is thought to be a variety of *Schizocodon soldanelloides*, with more variable lvs. and fls. ranging from red to white. Offered by many European dealers, and by one or two Americans; little known here.

W. M.

SCHIZOLÒBIUM (Greek, *to cleave* and *hull;* alluding to the manner of dehiscence). *Leguminòsæ.* About 2 species of South American trees, with large bipinnate leaves, with numerous small leaflets, and fls. in axillary racemes or terminal panicles. Calyx obliquely turbinate; segments imbricated, reflexed; petals 5, clawed, ovate or roundish, imbricated; stamens 10, free; filaments somewhat scabrous at the base: ovary adnate to the tube of the calyx: pod 1-seeded. The following has been introduced into S. Calif. by Franceschi, who writes that it has not yet proved a success.

excélsum, Vog. A large Brazilian tree, with fern-like bipinnate leaves about 4½ ft. long, with the ultimate lfts. about 1½ in. long: fls. yellow, in large panicles. R.H. 1874, p. 113.

F. W. Barclay.

SCHIZONÒTUS (Greek, *schizo*, to split, and *notos*, back: the capsules were thought to split on the back, which, however, is not the case). *Rosàceæ* (Syn. *Holodìscus*). The name *Holodiscus* (meaning an entire disk) may be recommended for this genus instead of *Schizonotus*, to avoid confusion, since the latter name has been used for two other genera. Ornamental free-flowering deciduous shrub, with alternate, pinnately lobed, petioled lvs. and small, whitish fls. in ample showy panicles: fruit insignificant. Very graceful plants, with their drooping feathery panicles of creamy white fls., and well adapted for borders of shrubberies or for single specimens on the lawn, but not quite hardy north. They grow in almost any well-drained soil, and do best in a sunny position. Prop. by seeds usually sown in boxes in fall and only slightly covered with soil, or by layers; sometimes also increased by greenwood cuttings under glass taken with a heel, but usually only a small percentage of them take root. Two or perhaps only one species from Oregon to Columbia. Lvs. without stipules: calyx 5-cleft, almost rotate; petals 5; stamens about 20: ovaries 5, surrounded by an entire disk, developing into 5 distinct pubescent 1-seeded akenes. Formerly usually referred to Spiræa, but it shows closer affinity to Cercocarpus and other genera of the Potentilleæ group. If all forms of this genus are united in one species it must bear the name *Schizonotus argenteus*, Kuntze. By some the genus is still retained with Spiræa.

2268. Schizocodon soldanelloides (× ½).

dìscolor, Raf. (*Holodìscus dìscolor*, Maxim.). Fig. 2269. Shrub, 20 ft., hardy with protection in Mass.: lvs. ovate or oblong, truncate or narrowed at the base, pinnately lobed, usually glabrous above, pubescent or tomentose beneath, ½–3 in. long: fls. creamy white, small, in ample panicles. July. Oregon to Guatem., east to Colo. Gn. 45, p. 56; 47, p. 188; 49, p. 104; 50, p. 278.

G.C. III. 25:21.—A very variable species, of which the following are perhaps the most important forms: Var. **ariæfòlius**, J. G. Jack (*Spiræa ariæfòlia*, Sm.). Large shrub, with arching branches: lvs. usually truncate at the base, ovate, with dentate or entire lobes, pale green and pubescent beneath: panicle drooping, ample to 10 in. long. B.R. 16:1365. G.F. 4:617. Var. **Purshiànus**, Rehd. (*Sp. discolor*, Pursh). Similar to the former, but lvs. whitish-tomentose beneath. Var. **fissus**, Rehd. (*Sp. fissa*, Lindl., and probably *Holodìscus austràlis*, Heller). Similar to var. *ariæfolius* in habit, but smaller: lvs. crenate at the base, narrower, with entire lobes, whitish-tomentose beneath; panicle drooping, loose, to 5 in. long. Var. **dumòsus**, Dippel (*Sp. dumòsa*, Nutt. *Sp. Boursièri*, Carr.). Erect shrub, 8 ft. high: lvs. cuneate, coarsely toothed, pubescent above, whitish-tomentose beneath, ½–1 in. long: panicle erect, rather small and dense. R.H. 1859, p. 519. This last form is the least desirable as an ornamental plant.

S. purpuráscens, Gray, is Solanoa purpurascens Greene, a Californian Asclepiad, not in cult. It is a perennial with ascending stems 1 ft. high, cordate-ovate lvs., and small red-purple fls. in compact umbels.—*S. tomentòsus*, Lindl.=Sorbaria Lindleyana

Alfred Rehder.

SCHIZOPÉTALON (Greek, *cut* and *petal;* in reference to the pinnately cut petals). *Cruciferæ*. A genus of possibly 5 species of annual herbs from Chile, with alternate, sinuate, dentate or pinnatifid leaves and purple or white flowers in terminal racemes. The main generic character lies in the shape of the petals, which are flat and pinnately cut into regular segments.

Wálkeri, Sims. Plant 1–2 ft. high: lvs. sessile, sinuate, dentate, the upper linear: fls. white, fragrant. B.M. 2379. R.H. 1880, p. 355.—A very pretty annual of quick growth

F. W. Barclay.

SCHIZOPHRÁGMA (Greek, *schizein*, to cleave, and *phragma*, wall: the inner layer of the wall of the valves is cleft into fascicled fibers). *Saxifragàceæ*. Ornamental climbing deciduous shrub with opposite, long-petioled, rather large, dentate leaves, and loose terminal cymes of small white flowers with enlarged sterile ones at the margin. It has beautiful bright green foliage and attractive flowers. The plant is useful for covering walls and trunks of trees. It clings firmly by means of aërial rootlets. Hardy north as far as New York city. It thrives best in rich, moderately moist soil and partial shade, but also does well in full sun. Prop. by seeds or greenwood cuttings under glass; also by layers. Like *Hydrangea petiolaris*, young plants produce small lvs. and make little growth if unsupported and suffered to trail on the ground. One species in Japan and another in China, allied to Hydrangea and Decumaria: fls. in loose cymes; sepals and petals 4–5; stamens 10; style 1: ovary 4–5-loculed: marginal sterile fls. consist only of one large white sepal, terminating the branchlets of the inflorescence: fr. a small, 10-ribbed capsule.

hydrangeoides, Sieb. & Zucc. Climbing Hydrangea. Climbing to 30 ft. and more: lvs. on petioles 2–3-in. long, reddish, orbicular or broadly ovate, shortly acuminate, rounded or cordate at the base, remotely and coarsely dentate, bright green above, pale beneath, almost glabrous, 2–4 in. long: cymes peduncled, 8 in. broad; marginal fls. pedicelled, consisting of an oval to broadly ovate white sepal about 1½ in. long. July. Japan. S. Z. 1:26, 100. Gn. 15, p. 301; 34, p. 281.—The species is often confounded with *Hydrangea petiolaris*, which is easily distinguished by its marginal fls. having 4 sepals. It has been once introduced under the name *Cornidia integerrima*, which is a Chilean plant with entire evergreen leaves. The plant usually thrives best in a shady exposure.

Alfred Rehder.

SCHIZÓSTYLIS (Greek, *to cut*, and *style:* alluding to the filiform segments of the style). *Iridàceæ*. Two species of South African perennial herbs with tufted, sometimes fleshy roots, narrow equitant leaves and a slender scape bearing 6–12 red sessile flowers in a distichous spike. Perianth with a cylindrical tube and bell-shaped limb divided into 6 nearly equal oblong segments: stamens inserted on the throat of tube: capsule obovoid-oblong, obtuse.

coccinea, Backh. & Harv. Crimson Flag. A winter-blooming tender plant: stem 1–2 ft. high, bearing 2–3 lvs.: basal lvs. 2–3, about 1½ ft. long: fls. bright red, about 2 in. across. B.M. 5422. F.S. 16:1637.—The following cultural notes are taken from Garden and Forest 9:16: "The species blooms from Oct. to late Dec. and is useful for cut-flowers at this season. It is perfectly hardy in England but of little use here except for indoor use. The roots should be planted out in rich soil in spring about 8 in. apart, and encouraged to make a strong growth. In the fall the plants may be lifted, potted and placed in a cool greenhouse, where they will flower. After flowering they may be stored in a frame until spring, when the fleshy roots will need to be separated (leaving 3–5 buds to each root), and planted out as before."

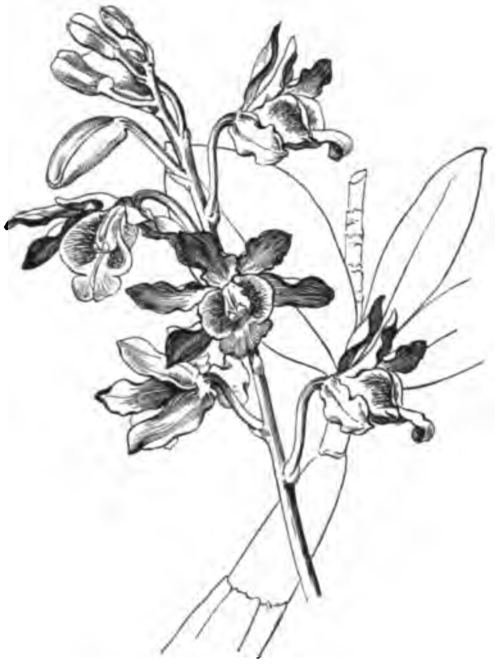
F. W. Barclay.

2269. Schizonotus discolor (× ½).

SCHOMBÚRGKIA (named for Dr. Schomburgk, naturalist and geographer, who explored British Guiana). *Orchidàceæ*. This genus contains about 12 species, inhabiting tropical America. They have the habit of Cattleyas or Lælias, except that they are less compact. Pseudobulbs long, fusiform, bearing several brown scales and 2–3 leathery lvs. at the summit: fl.-stems from the top of the pseudobulbs, sometimes very long, bearing a terminal raceme or panicle of showy fls. The fls. are like those of Lælia except that the sepals and petals are narrow and undulate and the labellum does not completely envelope the column. The labellum is always evidently 3-lobed.

Give Schomburgkias plenty of heat and a light place near the glass, which should be slightly shaded during the hot summer months. Give freely of water in the growing season. Rest them in a temperature of 55°. *S. tibicinis* and *S. Lyonsii* are to be classed amongst the showy easily grown orchids, resembling Lælias.

tibicinis, Batem. (*Epidéndrum tibicinis*, Batem.). Fig. 2270. Pseudobulbs 1–1½ ft. long, tapering upwards: lvs. 2–3, oblong, leathery: raceme 4–8 ft. high, bearing numerous fls. each 3½ in. across: sepals and petals oblong, undulate, crisp: lateral lobes of the labellum large, cucullate, middle lobe small, emarginate: fls. deep pink, speckled with white on the outside, rich chocolate-red within; labellum white within, deep rose color at the sides, with a short chocolate-red middle lobe. Summer. Honduras, Cuba. G.C. III. 4:212; 9:651. —Var. **grandiflòra,** Lindl. Fls. larger and paler, with more yellow in the lip. B.R. 31:30. B.M. 4476. F.S. 1:54. *S. tibicinis* requires less compost than the other species.



2270. Schomburgkia tibicinis (× ⅓).

Lyonsii, Lindl. Pseudobulbs about 1 ft. high, with 2–3 linear-oblong lvs. at the top: racemes erect, 9 in. long, bearing 12–25 fls., each subtended by a reflexed bract about 3 in. long: fls. 2 in. across; sepals and petals ovate to ovate-lanceolate, undulate, white with several rows of purple spots; labellum larger, recurved, acute, white, with a yellowish brown crisp margin; anther 2-horned. Aug. Jamaica. B.M. 5172. F.S. 20:2130. G.C. III. 26:203.

ròsea, Linden. Related to *S. undulata*. Bracts, peduncles and labellum light rose: sepals and petals oblong, undulate, narrower than the labellum; labellum with rotund lateral lobes and a smaller subrotund middle lobe, margin crisp. Colombia.

críspa, Lindl. Pseudobulbs numerous, long: lvs. oblong-lanceolate: fls. yellowish brown; sepals and petals oblong, undulate; labellum ovate-oblong, obscurely 3-lobed. Guiana. B.R. 30:23. B.M. 3729 (as *S. marginata*, var.).

undulàta, Lindl. Fls. in a dense raceme; sepals and petals linear, undulate, crisp, longer than the labellum, rich brownish purple; labellum cucullate, middle lobe oval, acute or obtuse, violet-purple. Jan. Colombia. B.R. 31:53.

Heinrich Hasselbring and Wm. Mathews.

SCHÒTIA (Richard Schot, companion of Jacquin during his travels in America, 1754–59). *Leguminòsæ.* A genus of 3 species of small trees or shrubs, native to S. Africa, with pinnate leaves and panicles of handsome crimson, pink or flesh-colored flowers. Calyx 4-lobed; petals 5, nearly sessile, either ovate to oblong or small and scale-like; stamens 10, free or shortly connate: pod oblong or broadly linear, coriaceous, compressed, the upper margin or both margins winged: seeds 1–6.

A. *Fls. on rather long pedicels.*

B. *Petals longer than the calyx.*

speciòsa, Jacq. A tree or shrub, about 10 ft. high: lvs. variable in form, which fact has led to much separation of this species into varieties and species: lfts. 8–32, linear, oblong, or obovate: fls. crimson, in terminal panicles. B.M. 1153 (as *S. tamarindifolia*). —Advertised in southern California.

BB. *Petals shorter than the calyx.*

brachypétala, Sond. A large shrub or small tree: lfts. 8–10, larger than in *S. speciosa*, ovate-oblong or obovate: panicles many-fld., axillary and terminal: calyx-tube conical, crimson; petals very small, linear, hidden by the calyx.—Cult. in southern Florida.

AA. *Fls. nearly sessile.*

latifòlia, Jacq. Becoming a tree 20–30 ft. high: lfts. 4–8, ovate-oblong or obovate, usually 1½–2½ in. long, ½–1 in. wide: fls. rosy or flesh-colored, in much-branched panicles; petals longer than the calyx.—Advertised in southern California.

F. W. Barclay.

SCHRÁNKIA (F. P. Schrank, director of the botanic gardens in Munich). *Leguminòsæ.* Sensitive Brier. About 10 species of perennial herbs or shrubs, mostly American, with bipinnate, usually sensitive leaves and small pink or purple fls. in axillary peduncled heads or spikes. Calyx and corolla regular, 4–5-parted; stamens 8–12: pod linear, acute or acuminate, spiny all over, becoming 4-valved, several-seeded.

uncinàta, Willd. Sensitive Brier. A hardy herbaceous perennial, branched and decumbent, 2–4 ft. long, well armed with short prickles: lvs. very sensitive, with about 6 pinnæ; pinnæ with 16–30 lfts.: fls. pink, in globular heads nearly 1 in. through. May–July. Va. to Ill. and south. B.B. 2:256.

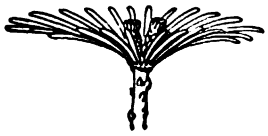
F. W. Barclay.

SCHRÉBERA (perhaps after J. C. D. Schreber, 1739–1810, physician and naturalist). *Oleàceæ.* A genus of 4 species of trees from Africa and India, with unequally pinnate leaves and flowers in very much branched cymes: calyx tubular-bell-shaped, irregularly 4–7-lobed; corolla salver-shaped: tube cylindrical; lobes 4–7, spreading; stamens 2, near the top of the corolla-tube: ovary 2-celled.

swietenioides, Roxb. A tree, about 40 ft. high, nearly glabrous: lfts. 5–7, ovate, acute, 4 x 2 in.: fls. white, with brown marks, about ½ in. across, in many-fld. cymes. Cult. in southern Florida.

SCHUBÉRTIA is a subgenus of Araujia, but in this work it is accounted for under *Physianthus*.

SCIADÓPITYS (Greek, *skias*, *skiados*, umbrella, and *pitys*, spruce; alluding to the position of the leaves). *Coniferæ.* Umbrella Pine. Evergreen tree, of narrow pyramidal habit, with linear, rather large, needle-like leaves in whorls and oval cones 3–4 in. long. The only species is hardy as far north as Portland, Me., and is a beautiful conifer of compact, conical form, with glossy dark green foliage. It is of rather slow growth. It thrives well in a moderately moist, loamy, and also in clayey soil. Prop. by seeds and layers, and sparingly by cuttings of half-ripened wood in summer; but seedlings are to be preferred, as they grow more symmetrically and more vigorously. Monotypic genus from Japan. Lvs. linear, deeply furrowed on both sides, disposed in whorls at the ends of the short annual shoots; they are of two kinds: the true lvs. are small and bract-



2271. Whorls of foliage of Sciadopitys verticillata (× ⅙).

like; the upper ones, crowded at the apex of the shoot, bear in their axils needle-like lvs. of another kind, which, however, are considered by some botanists to be leaf-like shoots, or cladophylla, but linear and connate in 2's, while others believe them to consist of two connate lvs. corresponding with the lf.-clusters in Pinus. Their morphological structure points towards the first explanation, while they are lvs. in regard to their physiological function. Fls. monœcious; the staminate oval, consisting of spirally disposed 2-celled anthers and appearing in dense clusters at the ends of the shoots; the pistillate are solitary at the ends of the shoots and consist of numerous spirally arranged scales subtended by a small bract and bearing 7–9 ovules: cone oblong-ovate, woody, the bracts connate, with the broadly orbicular, thick scales, spreading at the margin; seeds oval, compressed, with narrow wing, emarginate at the apex. The wood is nearly white, very strong and straight-grained.

verticillàta, Sieb. & Zucc. UMBRELLA PINE. Fig. 2271, 2272. Tree, attaining 100 ft., with ascending branches forming a narrow pyramidal, compact head, in old age loose and with pendulous branches: scale-like lvs. dark brown, ⅛ in. long: needles 15–35 in each whorl, linear, stiff, obtuse, deeply furrowed on both sides, dark green and glossy above with a white line beneath, 3–6 in. long: cone 3–5 in. long, ovate-oblong; seed ½ in. long; cotyledons 2. Japan. S.Z. 2:101, 102. F.S. 14:1485, 1486. Gt. 32, p. 149; 37, p. 437. Mn. 4, p. 154. Gng. 1:25. Gn. 28, p. 204, 205; 38, p. 499. R.H. 1884, p. 16, 17.—There is a dwarf var. and a var. with variegated foliage, both introduced from Japan.

ALFRED REHDER.

2272. Umbrella Pine—Sciadopitys verticillata (trimmed).

SCÍLLA (the old Greek name used by Hippocrates; *I injure*, according to Miller, alluding to the poisonous bulbs). *Liliàceæ*. SQUILL. WILD HYACINTH. BLUEBELL. About 80 species of perennial bulbous plants, widely distributed in Europe, Asia and Africa in temperate districts. They are remarkable for easy culture, quick growth and beautiful blue, rose or white flowers, blooming early in the spring (some in autumn), and therefore, desirable plants for the wild garden, rock garden, or border. Some are stove plants. Some of the South African forms have handsome spotted foliage.

Generically, the Squills are distinguished as follows: Bulb tunicated, large or small: lvs. radical, 1–several in number, linear, loriform, lanceolate, oblong or nearly ovate, in *Scilla autumnalis* appearing after the flowers; scape 1–several, simple, leafless: fls. in racemes, which are several- to many-fld., open, compact or spicate; bracts small, sometimes minute, hyaline: pedicels short or long, sometimes filiform: fls. small or middle-sized (1 in. across), segments of perianth distinct, perianth blue, porcelain-blue, rose-colored or whitish, open rotate, cylindrical-campanulate, or open campanulate, segments persistent for some time; stamens 6, affixed at base or below the middle of the segments; anthers ovate or oblong, dehiscing longitudinally, introrse; ovary sessile, stigma small capitate; ovules 2 in each locule, rarely 8–10, ascending: capsule globose; seeds 1–2 in each cell, rarely more; testa black, appressed; embryo small in albumen. The genus is distinguished from *Ornithogalum* chiefly by the color of the flowers and deciduous perianth, from *Hyacynthus* by the segments distinct from the base or very nearly so. Great Britain possesses three species of *Scilla*, *S. verna*, *S. autumnalis* and *S. nutans*, while Germany has, in addition to *S. autumnalis*, three others, viz., *S. amœna*, *S. bifolia* and *S. Italica*.

Among the early flowers there are none more valuable than the Scillas. They vary considerably in form of flower and foliage, and although typically they have blue or blue-purple flowers, most, if not all of the species in cultivation have white and red-purple forms. *Scilla Sibirica* and *S. bifolia* are the earliest to flower, and of these forms the Asia Minor or Taurian forms are in advance. The form of *S. Sibirica* known as *multiflora* is nearly over before the usual type begins to expand. There is also sometimes cultivated in the garden a pleasing white Scilla, with hyacinth-like flowers, known to the trade as *S. amœna*. But these white forms are mostly oddities; the effective ones are the blue-flowering kinds. Occasional hybrids between Scillas and Chionodoxas are met with (see p. 300). *Chionoscilla Alleni* is the accepted name for a natural hybrid between *Chionodoxa Luciliæ* and *Scilla bifolia*, first obtained by Mr. Allen, of Shepton, Mallet, in 1891.

None of the hardy Squills require special culture, and if planted where they can remain undisturbed for a series of years, they seldom disappoint one if the soil is occasionally enriched by top-dressings of manure, etc. The bulbs should be planted as early as possible in autumn. The varieties may be increased by offsets taken after the foliage has matured. For the cool greenhouse or conservatory, many of the Scillas are ideal subjects. For this culture, 5 or 6 bulbs may be put in a 5-in. pot and the vessel afterwards transferred to a coldframe and covered until growth commences. Up to this period very little water will be required, but as the flower-cluster appears the quantity should be increased and the pots transferred to the greenhouse, giving them a position near the glass. The foliage matured, the bulbs may be shaken out of the soil and stored.

Urginea Scilla, formerly called *Scilla maritima*, needs to be mentioned in this connection on account of its yielding a medicine for many centuries held in esteem. Almost every one is familiar with syrup of Squills, and has obtained relief from its use in severe colds. The scales of the bulb contain mucilage, sinistrin, sugar and crystals of calcium oxalate (stated by botanists to ward off snails): the active principles are scillipicrin, scillitoxin and scillin (the latter producing numbness, vomiting, etc.). Scilla bulbs or roots should never be used unless under proper direction, as, in their fresh state they are extremely acrid, and might prove dangerous.

The trade names are considerably confused. Many of the so-called horticultural species and races may be united as mere varieties of species, that have been defined botanically. The following names are believed to include all those in the American trade, but other species are known to fanciers.

INDEX.

amœna, 13.
autumnalis, 6.
bifolia, 9.
campanulata, 3.
cernua, 1.
Chinensis, 5.
ciliaris, 7.
Clusii, 7.
festalis, 1.
Hispanica, 3.
hyacinthoides, 11, 3.
Italica, 14.
Japonica, 15.
monophylla, 8.
monophyllos, 8.
Natalensis, 10.
nonscripta, 1.
Numidica, 4.
nutans, 1.
parviflora, 4, 11.
patula, 3.
Peruviana, 7.
præcox, 12.
pumila, 8.
puschkinioides, 2.
scilloides, 5.
Sibirica, 12.
verna, 16.

- A. *Shape of fls. campanulate: color blue, blue-lilac, rose-purple, white.*
  - B. *Pedicels short: bracts linear, in pairs: raceme many-fld.: fls. broadly campanulate, produced from April to June* ... 1. **festalis**
  - BB. *Pedicels short: bracts in pairs, scarious-hyaline* .... 2. **puschkinioides**
  - BBB. *Pedicels long (1–1½ in.): raceme equilateral, compact: fls. cylindrical-campanulate, produced in May* .... 3. **Hispanica**
- AA. *Shape of fls. saucer-shaped to open-rotate.*
  - B. *Color of fls. rose, size small.*
    - C. *Size of fls. small, color rose-purple: raceme dense, 30–60-fld.: lvs. linear, fleshy*..................... 4. **Numidica**
    - CC. *Size of fls. very small (one-eighth in. long): raceme dense: scape slender: bracts whitish, minute*.... 5. **Chinensis**
    - CCC. *Size of fls. larger (½ in. in diam.): pedicels long, ascending or spreading: raceme open. July to Sept*.. 6. **autumnalis**
  - BB. *Color of fls. blue or lilac-blue: size larger (¾–1 in.).*
    - C. *Raceme very dense (100–15-fld.), at first conical, then long, compact and broad: scape robust. May*...... 7. **Peruviana**
    - CC. *Raceme several- to many-fld., open: fls. mostly distant.*
      - D. *Lvs. single: raceme about 5-fld.: plant small. May*................... 8. **monophyllos**
      - DD. *Lvs. in pairs, cucullate: raceme 3–8-fld., ebracteate: perianth blue, reddish, or whitish. March.* 9. **bifolia**
      - DDD. *Leaves more than 2.*
        - E. *Foliage very broad-lanceolate: bulb large: raceme many-fld. (50–100). April*..10. **Natalensis**
        - EE. *Foliage large, broad (½–1½ in.); margin ciliate-denticulate: racemes many-fld., open. August*........11. **hyacinthoides**
        - EEE. *Foliage lanceolate, sometimes narrowly so.*
          - F. *No. of fls. 1–3*........12. **Sibirica**
          - FF. *No. of fls. 4–8. March*.............13. **amœna**
          - FFF. *No. of fls. 6–30: raceme at first conical, then open*..........14. **Italica**
          - FFFF. *No. of fls. 20–60: scapes 1–3: bracts minute, linear, white* ....15. **Japonica**
        - EEEE. *Foliage linear, thick, channeled: raceme 6–10-fld: fls. fragrant. April to May* ....16. **verna**

1. **festàlis**, Salisb. (*S. nùtans*, Sm. *S. nonscripta*, Hoff. and Link. *S. cérnua*, Salisb.). COMMON BLUEBELL. HAREBELL. Lvs. 10–18 in. long, ½ in. broad, subacute, concave: scape solitary, tall, stout; raceme 6–15-fld.: bracts in pairs: fls. blue, purple, white or pink, drooping. April to June. Western Europe, Great Britain. B.M. 1461.—Among the garden forms are **álba**, white; **cærùlea**, blue; **lilacina**, lilac-blue; **ròsea**, rose or pink colored; **cérnua**, nodding. This is one of the most beautiful of Squills, fragrant, thriving best in somewhat shady and sheltered places. Originally placed in the genus Hyacinthus, on account of the general form of the perianth, it was removed to Scilla as having the segments distinct or nearly so, and is now often considered as forming a distinct genus (Agraphis, Link; Endymion, Dumort), either alone or with other species which connect it with the other Scillas.

2. **puschkinioides**, Regel. Bulb ovate, tunicate: lvs. radical, 2–4, glabrous, broadly linear, obtuse, 2½–3 in. long: scape low, glabrous: pedicels erect, strict, short, base bibracteate; bracteoles scarious, hyaline: perianth campanulate, pale blue, middle nerve deeper blue: base of filaments united; anthers linear-oblong; style filiform. Turkestan.

3. **Hispánica**, Mill. (*S. campanulàta*, Ait. *S. pátula*, DC.). SPANISH JACINTH. BELL-FLOWERED SQUILL. Lvs. 5 or 6, glabrous, ascending, lanceolate, ½–1 in. broad, subobtuse, convex at back: scape long: raceme equilateral, compact: fls. cylindrical-campanulate; perianth usually blue but often becoming rose-purple, or white: pedicels 1–1½ in. long. May. Spain and Portugal. B.M. 1102.—Hardy. Several varieties of it are in the trade under the specific name *campanulata;* viz., **álba**, white; **albo-màjor**, large white; **cárnea**, flesh-colored; **hyacinthoides**, hyacinth-like; **ròsea**, rose-colored. This species is worthy of wider acquaintance. The bulbs are cheap and easily obtained in autumn, and if planted then they are sure to bloom the following spring.

4. **Numídica**, Poir. (*S. parviflòra*, Desf.). Bulb ovoid, 1–2 in. thick: lvs. 4–6, fleshy, herbaceous, linear, 6–8 in. long, 1½–3 lines broad, suberect: scape solitary or paired, ½–1 ft. high: racemes dense, 30–60-fld.: pedicels short, ascending, 3–5 lines long: bracts minute, linear, evanescent: perianth rose-purple, 1½ lines long: single ovule in each of the ovarian cells: capsule small, globose, grooved. Flowering in winter in its native home, Algeria.

5. **Chinénsis**, Benth. (*Barnárdia scilloìdes*, Lindl.). CHINESE SQUILL. Leaves 2 or 3, equaling or exceeding the scape, rather hard, acute, channeled: bulb small, ovate: scape erect, slender, or wand-like: raceme spicate, dense, elongated: pedicels short; bracts whitish, minute: perianth rose-colored tipped with green; stigma a mere point. June. China. B.M. 3788.—Half-hardy. A beautiful species with the dense elongated raceme of rose-colored flowers, worthy of cultivation in any rock garden.

2273. Scilla Peruviana in full bloom (× ¼). Also known as *Scilla ciliaris*.

6. **autumnàlis**, Linn. AUTUMN SQUILL. STARRY HYACINTH. Lvs. several, obtuse, channeled, half-terete, growing on through the winter and dying away in the spring: scapes several: racemes corymbose, spicate, open: perianth rose-colored, ½ in. across. July–September. Europe (Great Britain), North Africa. B.M. 919.—Hardy. The flowering stems generally precede the

lvs. but occasionally the two come up together. As the flowering advances, in most cases a tuft of lvs. similar to those of *S. verna* shoot out by the side of the stem for the following year.

7. **Peruviàna,** Linn. (*S. ciliàris*, Hort. *S. Clùsii*, Parl.). Cuban Lily. Peruvian Jacinth. Hyacinth of Peru (once thought to be a Peruvian plant). Figs. 2273, 2274. Bulb large, ovate, tunicate: lvs. many, broad-linear, 6–12 in. long; margins ciliated with minute white bristles, channeled: scape robust, terminated by a many-fld. conical, broad and compact raceme of purple, lilac, reddish or whitish fls.: fls. rotate; corolla persistent; anthers short. May, June. Region of Mediterranean, not Peru. B.M. 749. Gn. 27, p. 288. R.H. 1882, p. 508.—The Hyacinth of Peru is not hardy in Mass. It propagates freely by offsets. It flowers all through May and June and forms a most attractive object in the herbaceous border or bed. *S. Peruviana*, however, has one fault that may tell against it in the opinion of many cultivators—it never flowers two years in succession; it seems to need a whole year's rest after the effort of producing its large spike of flowers.

2274. Scilla Peruviana, at the end of its flowering season.

8. **monophỳllos,** Link (*S. monophýlla*, Plan. *S. pùmila*, Brot.). Dwarf Squill. Leaf solitary, inclosing the base of the scape, 2 in. long, ½ in. broad, involute, ovate-acuminate, with a callous apex, glabrous: scape erect, slender, usually 5–20-fld.: pedicels long, ascending, springing from a small sheathing bract: perianth bright lilac, ½ in. across, open, spreading; filaments lilac-blue, dilated at base; anthers erect, blue. May. Spain, Portugal. B.M. 3023.—Hardy.

9. **bifòlia,** Linn. Fig. 2275. Bulb tunicated, oblong-oval: lvs. 2, seldom 3, cucullate, 4–8 in. long, ¼–½ in. broad: scape 2–8-fld., ebracteate: fls. stellately rotate; perianth blue, sometimes reddish or whitish: anthers blue, versatile. March. Native to Europe, Asia Minor. B.M. 746.—Hardy. Several varieties of this exquisite little plant are in the trade: **álba,** white-fld.; **ròsea,** pink-fld., etc. Cultivators would do well to obtain all the varieties possible; also as many bulbs of this beautiful species as they can afford. It is one of the most charming of hardy, early spring-flowering plants.

10. **Natalénsis,** Planch. Bulb thick, large, ovoid, subglobose: lvs. broadly lanceolate, glabrous, 9–12 in. long, 3–4 in. broad, ascending: scape erect, terete, 1–1½ ft. long: raceme dense, simple, elongated, open, many-fld. (50–100): bracts solitary, subulate: fls. pale blue, stellate, rotate: pedicels long, pale blue. Natal. B.M. 5379. F.S. 10:1043.—Suitable for greenhouse culture. It is a graceful and elegant species, suitable for cultivation in pots.

11. **hyacinthoìdes,** Linn. (*S. parviflòra*, Salisb.). Hyacinth Squill. Lvs. 10–12, spreading, 1–1½ ft. long, ½–1¼ in. broad, narrowed at both ends, minutely ciliate-denticulate on the margins: scape straight, long: racemes many-fld., broad, open: pedicels long, 1–1½ in.: bracts whitish, minute, persistent; perianth bluish lilac, open, campanulate. Aug. Region of Mediterranean. B.M. 1140.—Hardy. This species is noted for its extreme shyness in flowering. The bulbs are sometimes 2 in. in diam., and produce a profusion of offsets. In Fish's "Bulb Culture" several varieties are mentioned: **cærùlea,** fine blue; **álba,** fine white, free-flowering; **ròsea,** distinct flesh-colored; **rùbra,** deep red, large and fine.

12. **Sibírica,** Andr. (*S. amœna*, var. *præcox*, Don). Siberian Squill. Fig. 2276. Lvs. 2–4, ascending, narrow, 4–6 in. long: scapes 1–6, 3–6 in. long: racemes 1–3-fld.: fls. rotate, horizontal or drooping, with short pedicels; perianth deep blue. March. Russia, Asia Minor. B.M. 1025. Gn. 11, p. 165. P.M. 14:100. L.B.C. 2:151.—Hardy. This plant ought always to have a little shelter. It forms attractive tufts and has a desirable habit for rock gardens. Several trade forms exist; viz., **álba, multiflòra, pállida.**

13. **amœna,** Linn. Star Hyacinth. Fig. 2277. Lvs. 4–7, flaccid, ascending, glabrous, 6–9 in. long, ⅛–⅜ in. broad: scapes several, equaling the lvs.: racemes several-fld., 4–8, open: fls. distant, ½–¾ in. in diam., blue: pedicels ascending or spreading. March. Austria, Germany. B.M. 341.—Hardy. It grows luxuriantly, several flowering stems being found on the same plant.

14. **Itálica,** Linn. Italian Squill. Bulbs ovate, clustered together: lvs. radical, several, flaccid, spreading, lanceolate, acute, 4–8 in. long, ¼–½ in. broad: scape solitary, slender, longer than the lvs.: raceme dense, many-fld.: pedicels filiform, spreading; bracts in pairs: fls. fragrant, smelling like lilac, pale blue: perianth rotate, blue; segments puberulous at apex; filaments white: anthers sagittate, dark blue. March–May. B.M. 663. L.B.C. 15:1483.—Hardy. This plant has less brilliant flowers than either *S. Sibirica* or *S. bifolia*, but abundantly compensates for the paleness of its blue by the fulness and the sweetness of its fragrance. It is also taller than either of the others.

15. **Japónica,** Baker (*Ornithógalum Japónicum*, Thunb. *Barnárdia Japónica*, Schultes, f.). Japanese Jacinth. Bulb ovoid, 9–12 lines thick: lvs. 2–3, fleshy, herbaceous, 6–12 in. long, 4–16 lines broad, acute: scapes 1–3, strict, erect: raceme 20–60-fld.: pedicels ascending: bracts minute, linear, white: perianth 1½ lines long, rose-purple: capsule turbinate, trisulcate, 2½–3 lines long; ovules solitary in each ovarian locule. Japan.

2275. Scilla bifolia (× ½).

16. **vérna,** Huds. Sea Onion. Spring Squill. A delicate little plant, with a small bulb and narrow-linear lvs. 2–4 in. long: scape seldom 6 in. long, with

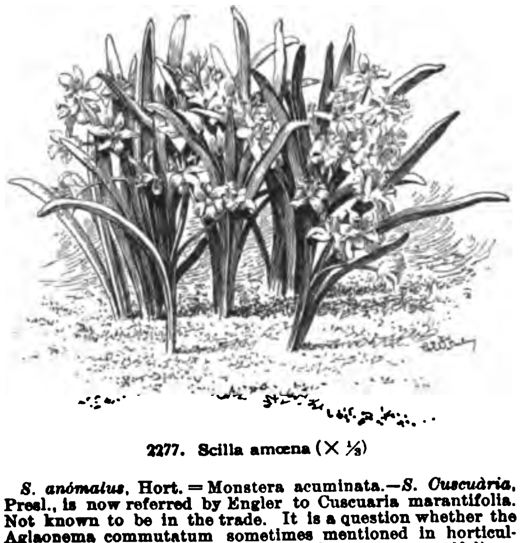
several small, erect blue fls. in a short, terminal raceme, almost flattened into a corymb: perianth segments scarcely above 3 lines long, spreading. Spring. A plant occurring in stony and sandy wastes near the sea in western Europe, reappearing farther east in Denmark, on the Rhine and Sardinia.—Hardy.

JOHN W. HARSHBERGER.

2276. Scilla Sibirica (× ⅓).

SCINDÁPSUS (an old Greek name, transferred to these plants). *Aràceæ.* Climbing perennials, differing from Monstera in floral characters and in the long-petioled, long-sheathed, ovate-lanceolate or ovate-acuminate lvs. Species 9 or 10. East Indies. Scindapsus comprises one popular and worthy warmhouse plant, that known to gardeners as *S. argyræus.* For culture, follow directions given under Philodendron.

pictus, Hassk. Internodes of the stem 3–4 in. long, 2 in. thick; petioles 1½–2 in. long; blade 4–6 in. long, 2½–3¼ in. wide, one side half as wide as the other, coriaceous, bright green (drying black), obliquely ovate-cordate. Var. **argyræus,** Engler (*S. argyræus,* Hort. *Pòthos argyræus,* Hort.), is the cult. form, with broad, deeply cordate leaf-blades which are spotted and blotched above with silvery white. Celebes, Philippines, Java, etc.



2277. Scilla amœna (× ⅓)

S. anómalus, Hort. = Monstera acuminata.—*S. Cuscuària,* Presl., is now referred by Engler to Cuscuaria marantifolia. Not known to be in the trade. It is a question whether the Aglaonema commutatum sometimes mentioned in horticultural literature is this species or is Aglaonema marantifolium, var. commutatum, Engler.—*S. pertùsus,* Hort. = Rhaphidophora pertusa.

JARED G. SMITH.

SCÍRPUS (Latin for bulrush). *Cyperàceæ.* BULRUSH. SEDGE. A large genus of rush-like or grass-like plants inhabiting the whole globe, and characterized by perfect flowers in spikes which are solitary, clustered or umbellate: scales spirally arranged: perianth of bristles or none, not enlarged in fruit: ovary one-loculed, with one anatropous ovule; style not thickened at the base, 2–3-cleft. Only a few species are in cultivation, and these are all perennials (except perhaps the last), suited for shallow water or damp places. The larger are important for use in aquatic gardens. The nomenclature of those in the trade has been very much confused.

A. *Stem leafy.*

atròvirens, Muhl. Stems clustered, tall and stout, 2–4 ft. high, bluntly triangular: lvs. long, coarse and firm, 3–6 lines wide, spreading: involucre foliaceous: umbel sparingly compound; rays stiff, very unequal: spikes ovoid-oblong, acutish, dark greenish brown, in dense heads of 5–25; scales oblong, cuspidate; perianth bristles 6, downwardly-barbed above; styles 3. Eastern U. S., in mud or damp soil.

Holoschœnus, Linn. Stiff and rush-like, from stout rootstocks: stems clustered, slender, cylindrical, 1–3 ft. high: lvs. 1–2, basal, stiff, erect and narrow, furrowed: bracts several, the larger one appearing as a continuation of the stem; spikes very numerous and small, closely packed in 1-several globular, light brown heads, 3–5 lines in diam.; scales ovate, mucronate, ciliate; perianth bristles none; styles 2–3-cleft. Eu., Asia. —The form in cultivation is var. **variegàtus,** Hort., with stems alternately banded with green and yellowish white. Damp or dry soil.

AA. *Stems with very short basal leaves, or none.*

lacústris, Vahl. GREAT BULRUSH. Rootstocks very stout: stems scattered, terete, smooth, tall, stout and flexible, 3–9 ft. high: lvs. reduced to a few basal sheaths: bracts very short, erect: umbel compound, flexuous: spikes in heads of 1–5, oblong-conical, pale brown, 2½–8 lines long; scales ovate-oblong obtuse, rarely mucronate; perianth bristles 4–6, downwardly barbed throughout; styles 2–3. In shallow quiet water, N. A., Eu., Asia. In Europe the 3-styled form is common; the 2-styled form is often referred to as var. **digynus,** Godr. (*S. Tabernæmontànus,* Gmel., and Hort.), but is scarcely distinct. Var. **zebrina,** Hort., is a form with alternate bands of green and yellowish white; often known as *Juncus zebrinus.*

cérnuus, Vahl (*S. ripàrius,* Spreng., not Hort. *Isólepis gràcilis,* Hort. *I. setàceus,* Hort.). Fig. 2278. Densely cespitose, forming turf: stems 3–12 in. long, very slender or filiform, cylindrical, erect or more often drooping; basal sheaths leafless or with a very short filiform blade; involucral bract subulate, about equaling the spikelet, the latter usually solitary, oblong-lanceolate, 1–3 lines long; scales oblong-oval, obtuse, pale brown or whitish; bristles none; styles 3; akene in greenhouse plants rarely maturing. Almost cosmopolitan, except in eastern U. S. and very variable.—Grows well in damp pots, the drooping stems producing a very graceful effect. Synonomy much confused.

K. M. WIEGAND.

SCLEROCÁRPUS (Greek, *hard* and *fruit;* referring to the bony, fructiferous bracts). *Compósitæ.* A genus of about 11 species of mostly Mexican herbs, with branching stems and terminal pedunculate radiate heads of yellow flowers in summer.

uniseriàlis, Benth. & Hook. (*Gymnópsis uniseriàlis,* Hook.). An annual herb 1 ft. or so high, loosely branched, with alternate, deltoid or rhombic-ovate, dentate, petioled lvs. and fragrant fl.-heads, with 5–9 oval or oblong, orange-yellow rays. Moist or shady ground, Texas and south. R. H. 1853:261.

F. W. BARCLAY.

SCOKE. A name for *Phytolacca decandra.*

SCOLOPÉNDRIUM. See *Phyllitis.* Many garden forms are cultivated under a variety of names, all derived from *Phyllitis Scolopendrium* (the *Scolopendrium vulgare* or the *S. officinarum* of Europe).

SCÓLYMUS (old Greek name used by Hesiod). *Compósitæ. Scolymus Hispanicus* (Fig. 2279) is the vegetable known as Golden Thistle or Spanish Oyster Plant. It makes a root much like salsify, except that it is much lighter colored and considerably longer. Its flavor is less pronounced than that of salsify, but when carefully cooked, it possesses a very agreeable quality which is somewhat intermediate between that of salsify and parsnip. It is adapted to all the methods of cooking employed for those vegetables. The particular value of the Spanish Oyster Plant, aside from affording a variety in the kitchen garden, is its large size and productiveness as compared with salsify. The product may be nearly twice as great, for a given area, as for salsify. The seeds are much easier to handle and sow than those of salsify. They are sown in March or April. The seeds, or rather akenes, are flat and yellowish, surrounded by a white scarious margin. The roots can be dug either in fall or spring. The greatest fault of the Spanish Oyster Plant lies in the prickly character of the leaves, which makes the plant uncomfortable to handle. The roots are often 10–12 in. long and 1 in. thick. It is said that the leaves and stalks are eaten like cardoons by the people of Salamanca; also that the flowers are used to adulterate saffron.

Scolymus Hispanicus, Linn., is a biennial plant native to southern Europe. The radical lvs. are very spiny, oblong, pinnatifid, dark green variegated with pale green spots. The plant grows 2–2½ ft. high, is much branched and bears bright yellow flower-heads, which are sessile and contain only 2 or 3 fls., all of which are ligulate. The heads are sessile, terminal and axillary.

2278. Scirpus cernuus (× ⅛).
Known to gardeners as *Isolepis gracilis*.

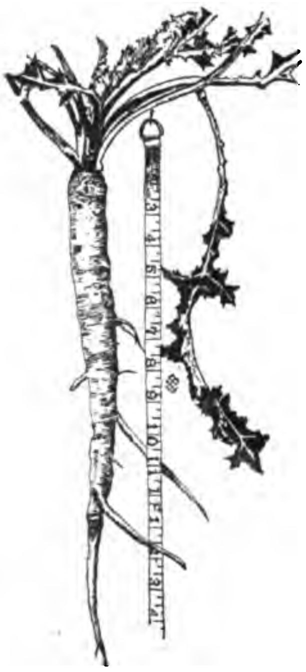
Scolymus contains 4 species, all natives of the Mediterranean region. *S. grandiflorus*, a perennial species, is rarely cult. abroad for its fls., and *S. maculatus*, an annual species, for its variegated foliage. L. H. B.

SCORPION GRASS. See *Myosotis*.

SCORPIÙRUS. See *Caterpillars* and *Worms*.

SCORZONÈRA (old French *scorzon*, serpent; *S. Hispanica* was used against snake-bites). *Compósitæ*. The vegetable known as Scorzonera or Black Salsify is a plant with a long, fleshy tap-root like that of salsify, but differing in having a black skin. The flesh, however, is white. It is cultivated and cooked like salsify, but being somewhat more difficult to raise it is rarer than that vegetable, although considered by many to be superior to it in flavor. The leaves may be used for salads. Scorzonera is a perennial plant, but it is treated in cultivation as an annual or biennial crop.

Botanically, also, Scorzonera is closely allied to salsify. The two vegetables are easily distinguished in root, leaf, flower and seed. The lvs. of Scorzonera are broader, the fls. are yellow (those of salsify being violet), and the seeds are white. Also, the involucral bracts of Scorzonera are in many series; of salsify, in 1 series. The genus Scorzonera is a large one—over 100 species, all natives of the Old World. Perennial herbs, or rarely annual, floccose, lanate or hirsute: lvs. sometimes entire and grass-like, or wider, sometimes more or less pinnately lobed or dissected: heads long-peduncled, yellow, the fls. all radiate: akenes glabrous or villous. Cult. same as salsify.


2279. Spanish Salsify, or Golden Thistle—Scolymus Hispanicus.

Hispánica, Linn. SCORZONERA. BLACK SALSIFY. Perennial herb 2 ft. high: stem much branched: lvs. clasping, lanceolate, undulate, glabrous: heads solitary at the ends of the branches. Spain. W. M.

SCOTÁNTHUS. See *Gymnopetalum*.

SCOTCH BROOM. *Cytisus scoparius*.

SCOTCH PINE. *Pinus sylvestris*.

SCOURING-RUSH. *Equisetum*.

SCREW BEAN. *Prosopis pubescens*.

SCREW PINE. *Pandanus*.

SCROPHULÀRIA (a reputed remedy for scrofula). *Scrophulariàceæ*. FIGWORT. A genus of about 100 species, mostly native of Europe, and of very little horticultural value. They are mostly perennial, tall-growing herbs, with usually large opposite leaves and small, often dull-colored flowers in a terminal thyrse in mid- or late summer. Corolla short; the tube globular or oblong, ventricose; lobes 5, unequal, 1 reflexed or spreading, the others erect; stamens 4, the sterile stamen represented by a scale on the throat of the corolla: seeds numerous.

nodòsa, Linn., var. **Marilándica**, Gray. A tall-growing, hardy perennial herb, usually 5 ft. high, often more, with large, dark green, ovàte acuminate lvs. and small, dull purplish or greenish fls. in a nearly naked, open thyrse. Throughout the United States.

The plant is sometimes used as a foliage background for the herbaceous border. It is too inconspicuous in flower and too weedy in habit for general use. The typical form is native to Europe and Asia.

F. W. Barclay.

SCULLION. See *Scallion.*

SCUPPERNONG. A variety of grape grown in the South. See *Vitis rotundifolia* and *Grape.*

SCURFY PEA. *Psoralea.*

SCURVY-GRASS (*Cochlearia officinalis*, Linn.), a common European perennial, is so called from its antiscorbutic qualities, which have long been recognized. Stimulant, diuretic, stomachic and laxative properties have been ascribed to it. In general appearance—leaf, flower, fruit—it somewhat resembles its close relative, water cress, but in flavor it is acrid, bitter, pungent, and has a strong suggestion of tar. Bruising reveals a disagreeable odor. When cultivated it is treated as an annual, the seed being sown upon garden loam in a cool, shady place where the plants are to remain. It is grown to a limited extent in America, has escaped from cultivation, but so far has not become obnoxious as a weed like water cress.

M. G. Kains.

SCUTELLÀRIA (Latin, *dish;* referring to the form of the persistent calyx). *Labiàtæ.* Skullcap. A genus of nearly 100 species of annual, perennial or shrubby plants widely scattered about the world, with simple leaves and blue, yellow or red, tubular 2-lipped flowers in terminal spikes or racemes or in the axils of the stem-leaves. Calyx in anthesis bell-shaped, gibbous, with a helmet-shaped projection; stamens 4, ascending and parallel, all fertile, the two anterior longer: anthers ciliate, pilose.

INDEX.

alpina, 5.
angustifolia, 8.
antirrhinoides, 9.
Baicalensis, 1.
brevifolia, 2.
galericulata, 6.
grandiflora, 11.
lateriflora, 10.
macrantha, 1.
Mociniana, 7.
orientalis, 11.
resinosa, 3.
Wrightii, 4.

A. *Lvs. sessile or nearly so.*
  B. *Foliage entire.*
    C. *Habit procumbent*........... 1. **Baicalensis**
    CC. *Habit erect.*
      D. *Fls. in terminal racemes*.. 2. **brevifolia**
      DD. *Fls. in axils of stem-leaves.*
        E. *Plant with moniliform tubers* .... 3. **resinosa**
        EE. *Plant without moniliform tubers* .... 4. **Wrightii**
  BB. *Foliage serrate or dentate.*
    C. *Habit procumbent*........... 5. **alpina**
    CC. *Habit erect*.................. 6. **galericulata**
AA. *Lvs. petioled.*
  B. *Color of fls. red*............... 7. **Mociniana**
  BB. *Color of fls. not red.*
    C. *Margin of lvs. entire.*
      D. *Shape of lvs. linear* ...... 8. **angustifolia**
      DD. *Shape of lvs. oblong*...... 9. **antirrhinoides**
    CC. *Margin of lvs. serrate.*
      D. *Fls. 3–5 lines long* ....10. **lateriflora**
      DD. *Fls. longer*...............11. **orientalis**

1. **Baicalénsis**, Georgi (*S. macrántha*, Fisch.). A hardy perennial herb, almost glabrous: stem half erect, about 1 ft. high: lvs. lanceolate, obtuse, ciliate: fls. blue, in many simple racemes; calyx-hood incurved. July, Aug. Eastern Asia.

2. **brevifòlia**, A. Gray. A half-hardy, compact perennial, ½–1 ft. high: lvs. numerous, oblong, narrow, about ½ in. long: fls. dark purple, about ¾ in. long. Blooming season long; summer. Dry limestone banks, Texas.

3. **resinòsa**, Torr. A hardy perennial, a few inches high, resinous: lvs. ½–1 in. long, oval to oblong: fls. violet-blue, 1 in. long. Plains of Colo., Wyo. and Neb.

4. **Wrightii**, Gray. A tufted perennial, about 6 in. high, with numerous oval, ovate or spatulate-oblong lvs. about ½ in. long and violet or rarely white fls. ½ in. long. Kansas to Texas.

5. **alpìna**, Linn. A hardy spreading perennial, about 10 in. high, with ovate, serrately dentate lvs. and large, purple and white or somewhat yellowish fls. in dense, terminal racemes. July and August. Europe. R.H. 1889:12.—A handsome rock or low border perennial.

6. **galericulàta**, Linn. Hardy, perennial by filiform stolons, 1–3 ft. high: lvs. ovate to oblong-lanceolate, about 2 in. long: fls. solitary in the axils of the upper lvs., about 1 in. long. June–Sept. In moist ground throughout the U. S. and Eu. B.B. 3:83.

7. **Mociniàna**, Benth. A tender, moderately low, shrubby plant, probably the most showy of the genus, with opposite, long-elliptical, acute lvs., and long, tubular, red fls. with a yellow throat, about 1½ in. long, in dense, terminal spikes. Autumn. Mexico. R.H. 1872:350.—According to Gn. 10, p. 606, the plants are of easy culture with warm greenhouse treatment and may be grown as bush specimens or in smaller pots with a single stem, when they will flower at about 1 ft. in height. Cuttings are easily rooted.

8. **angustifòlia**, Pursh. A hardy perennial, about 6 in. high, with lvs. ½–1 in. long, narrowed at the base, and violet-blue fls. ¾–1 in. long, with the corolla-tube slender. Moist ground, northwestern United States.

9. **antirrhinoides**, Benth. Resembles the larger-leaved forms of *S. angustifolia*, but has longer petioles and the lvs. mostly obtuse at base and also shorter and broader fls. 7–10 lines long. Moist, shady ground, northwestern United States.

10. **laterifldra**, Linn. A hardy perennial, increasing by slender stolons, 1–2 ft. high: lvs. ovate to lanceolate, 1–3 in. long: racemes axillary or terminal, narrow, leafy bracted: fls. blue to nearly white. Moist soil throughout the United States.

11. **orientàlis**, Linn. (*S. grandiflòra*, Sims, not Adams). A hardy perennial, procumbent: lvs. long-petioled, ovate, dentate, tomentose: fls. purplish, with a yellow throat or almost entirely yellow. Altai Mts. B.M. 635.

J. B. Keller and F. W. Barclay.

SCUTICÀRIA (Latin, *scutica*, lash or whip). *Orchidàceæ.* This genus is remarkable for its long whip-like leaves, which are channeled on one side. No evident pseudobulbs are formed, but each shoot terminates in a long, pendulous leaf. The lvs. are rather crowded on the short rhizome. Fls. solitary or several, on short peduncles. In structure the fls. resemble Maxillaria, but the plants are easily distinguished by the terete leaves. Sepals and petals similar, the lateral ones forming a mentum: labellum movable, 3-lobed, with large, erect, lateral lobes: pollinia on a transversely elongated stipe. Two species from South America.

These plants require a temperature similar to Cattleya and Lælia, but should be grown on blocks or in shallow baskets in a mixture of equal parts peat fiber and sphagnum. *S. Steelii* does best on a block, as the plant grows downward in an inverted position. The compost should be kept moist at all times, particularly while the plants are in action. They are propagated by division.

Steèlii, Lindl. Lvs. attain a length of 4 ft., as thick as a goose-quill: fls. on short scapes; sepals and petals oblong, connivent, pale yellow, with chocolate blotches; labellum large, cream-colored, striped with brownish purple. Fls. at all seasons. British Guiana. B.M. 3573. B.R. 23:1986 (both as *Maxillaria Steelii*).

Hádwenii, Planch. Lvs. 1½ ft. long: fls. with spreading sepals and petals oblong, sharply acuminate, yellowish green, blotched with brown; labellum obovate-cucullate, white with flesh-colored spots. Brazil. B.M. 4629. F.S. 7:731 (both as *Bifrenaria Hadwenii*). G.M. 41:558.

Heinrich Hasselbring and R. M. Grey.

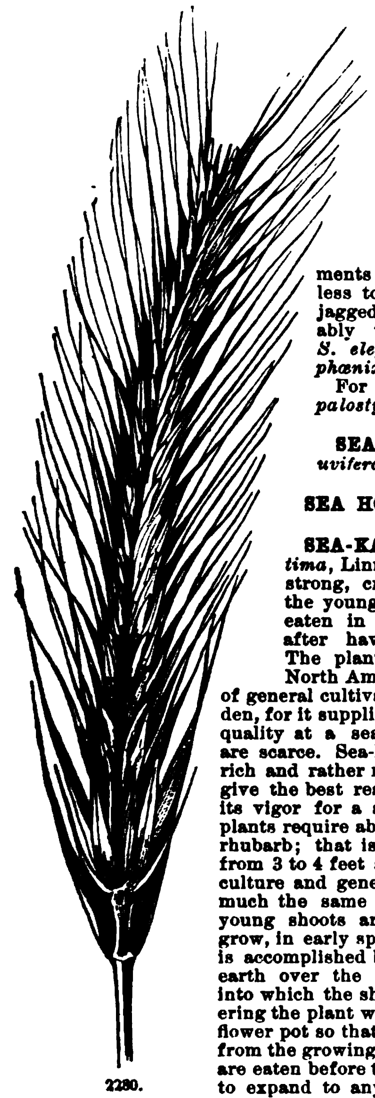
SCYTHIAN LAMB. Refer to *Cibotium.*

SEA BEAN. Consult p. 135, second column; Sea Buckthorn is *Hippophae;* Sea Daffodil is *Hymenocallis.*

SEAFÓRTHIA (Francis Lord Seaforth). *Palmàceæ*. *Seaforthia elegans* is a name familiar to every gardener who has room in his conservatory for tall specimen palms. Twenty years ago this palm was grown to a greater extent in smaller sizes and for a greater variety of purposes, but it has been superseded for such uses by the Kentias (*Howea Belmoreana* and *Forsteriana*). *Seaforthia elegans* is often called the Australian Feather Palm. Whether more than one thing is cultivated under this name is doubtful.

According to Flora Australiensis 7:141 (1878) the proper name of *Seafórthia elégans*, R. Br., is **Ptychospérma elégans,** Blume. It is variously described as a low or very tall palm: lvs. attaining several feet; segments numerous, more or less toothed or irregularly jagged at the end. Probably the plants cult. as *S. elegans* are *Archontophœnix Cunninghamii*.

For *S. robusta*, see *Rhopalostylis*. W. M.



2280. Head of Rye. Natural size.

SEA GRAPE. *Coccoloba uvifera.*

SEA HOLLY. *Eryngium.*

SEA-KALE (*Crambe maritima*, Linn.) is a large-leaved, strong, cruciferous perennial, the young shoots of which are eaten in the spring, usually after having been blanched. The plant is little known in North America, but it is worthy of general cultivation in the home garden, for it supplies an esculent of good quality at a season when vegetables are scarce. Sea-kale demands a deep, rich and rather moist soil, in order to give the best results and to maintain its vigor for a series of years. The plants require about as much room as rhubarb; that is, they should stand from 3 to 4 feet apart each way. The culture and general requirements are much the same as for rhubarb. The young shoots are blanched as they grow, in early spring. The blanching is accomplished by heaping fine, loose earth over the crown of the plant, into which the shoots grow, or by covering the plant with an inverted box or flower pot so that the light is excluded from the growing shoots. These shoots are eaten before the leaves have begun to expand to any extent, and whilst they are crisp and tender. The vegetable is prepared in the same manner as asparagus.

Sea-kale is propagated by root cuttings, and also by seeds. Quicker results are secured from cuttings. If strong cuttings, 4 or 5 inches long, are taken in early spring and grown in strong and rather moist soil, the plants may be strong enough for cutting the following spring; but it is usually better not to cut them until two years from starting. The cuttings may be placed where the plants are to stand permanently, or they may be grown in drills in a seed-bed. The latter plan is usually to be preferred, since it allows the plants to receive better care. Seeds give plants that are strong enough for cutting about the third year. The seeds are really fruits or pods, and each fruit may produce two or three plants. Usually the fruits are sown without shelling. The seedlings are raised in the seed-bed and transplanted when one year old to permanent quarters. On good soil, plants of Sea-kale should maintain their vigor for five to eight years after they have come to cutting age. As soon as they begin to show signs of decline, new plants should be propagated. Although the plant is hardy in the northern states, it is always benefited by a liberal dressing of litter or manure in the fall. Plants may be forced in hotbeds or under the greenhouse benches, as recommended for rhubarb. Sea-kale has large, glaucous, cabbage-like leaves which make it a striking plant for ornament early in the season. It also throws up a strong cluster bearing many rather showy white flowers. However, the plant is rarely propagated for its ornamental value. Sea-kale grows wild on the seacoasts of southwestern Europe. L. H. B.

SEA LAVENDER. *Statice.*

SEA ONION. *Urginea maritima;* also applied to *Ornithogalum caudatum.*

SEA PINK. *Armeria.*

SEASIDE GRAPE. *Coccoloba.*

SEASON VINE. *Cissus sicyoides.*

SEA-URCHIN CACTUS. *Echinopsis.*

SECÀLE (the ancient Latin name, said to be derived from *seco*, to cut; according to some, applied to spelt). *Gramineæ*. Species 2, *S. fragile*, an annual of southern Russia, and *S. cereale*, the cultivated Rye, which, according to Hackel, is derived from the perennial, *S. montanum*, native in the mountains of southern Europe and central Asia. Spikelets with 2 perfect fls. sessile on opposite sides of a zigzag rachis, forming a terminal spike, empty glumes subulate and 1-nerved, by which characters the genus differs from Triticum, in which the empty glumes are ovate and 3-nerved.

cereàle, Linn. RYE. Fig. 2280. A tall annual commonly cultivated in Europe, less so in this country, as a cereal. Also cultivated here for annual pasture. Fl.-glume long-awned. Much more commonly grown in New York and New England than westward.

A. S. HITCHCOCK.

SÈCHIUM (by some said to be derived from *Sicyos*, with which the genus was once united, by others to have come from the Greek *sekos*, a "fold," because swine are fed on it). *Cucurbitàceæ*. One very odd tendril-climbing vine, probably native to the West Indies and adjacent South America. This species, **S. édule,** Swartz, Fig. 2281, is known under a variety of names, as Chocho, Chuchu, Chow-Chow, Chayotte, Cahiota, Pepinella. The vine itself, with herbaceous annual stems, is useful for covering arbors in warm countries. The root becomes a large corky tuber, sometimes weighing 20 lbs., and is edible. The fruit is irregularly ribbed, 3–6 in. long (Fig. 2281, from nature), and edible. Sechium belongs to that group of the Cucurbitaceæ which comprises 1-seeded fruits. The single flat seed is 1–2 in. long (shown in upper specimen in Fig. 2281), and attached at the upper end of the cavity. It is not removed from the fruit, but the entire fruit is planted. Because seeds are not to be had separate, the notion has arisen that the fruit is seedless. Sometimes germination begins before the fruit drops from the vine. The fruit is variously ribbed and lobed, varying from pale green to cream-colored and white, according to variety, the surface shining and somewhat spiny. In tropical countries the fruit is cooked for eating, much as squash is served with us. Some persons prefer the roots to yams. *Sechium edule* is a common commodity in the West Indies, and the fruits are not rare in northern markets. It is also grown to some extent in Florida and southern California. In northern countries, the plant makes a strong vine in one season but does not bear. The plant has little ornamental value.

In Sechium the fls. are monœcious. The staminate are in short, long-stalked axillary clusters; the pistil-

late are solitary or in pairs on a short pubescent axillary pedicel. Corolla 5-lobed, green or cream-colored. Stamens 3, united into a glabrous or glandular column. Lvs. 4–6 in. across, cucumber-like, cordate-ovate and 5–7-angled, pointed, somewhat scabrous above. Tendrils opposite the lvs., 3–4-cleft. The plant grows 50 feet in warm climates. G.C. 1865:51; III. 24:476; 28:450.
L. H. B.

2281. Fruits of Sechium edule (× ¼).

SECURINÈGA (Latin, *securis*, hatchet, and *negare*, to refuse; alluding to the hard wood). *Euphorbiàceæ.* Deciduous shrubs, with alternate, petioled, entire, usually small leaves, small greenish or whitish flowers in axillary clusters or solitary, and capsular small subglobose fruits. *S. ramiflora* seems to be the hardiest species and the only one in cultivation in this country. It is fairly hardy at the Arnold Arboretum, usually only the tips of the young branches being winter-killed, and forms a handsome round bush with bright green foliage. It seems to grow in any kind of soil and is propagated by seeds and by greenwood cuttings under glass. About 10 species in temperate and subtropical regions of America, Asia and Africa, also in southern Europe, but none in N. America. Fls. unisexual, diœcious or monœcious in axillary, few-fld. cymes or solitary; sepals 5; stamens usually 5, with a 5-lobed disk at the base; pistillate fls. with entire disk and 3 2-parted styles: fr. a 3-lobed dehiscent capsule, 3–6-seeded.

ramiflòra, J. Müller (*Geblèra suffruticòsa*, Fisch. & Mey. *Flüggea suffruticòsa*, Baill. *Acidòton ramiflòrus*, Kuntze). Shrub, 3–6 ft. high: lvs. short-petioled, oval or ovate to ovate-lanceolate, acute or obtuse, cuneate at the base, entire, bright or yellowish green, glabrous, thin, 1–2 in. long: staminate fls. about 1⅛ lines across, in 5–10-fld. clusters; pistillate solitary: fr. about one-fifth in. across, greenish. July, Aug. S. Siberia to Amurland and Mongolia.

S. Leucopỳrus, Müll. Arg., belongs to Flüggea, a genus of 6 species distributed through the tropics of Asia, Africa and Australia; it is chiefly distinguished from Securinega by the seeds, which are concave on the ventral surface; the fr. is berry-like. F. Leucopyrus, Willd., is a spiny shrub, with tortuous, light-colored, glabrous branches: lvs. obovate to orbicular, emarginate, cuneate at the base, glabrous, ¾–1 in. long: fls. small, in axillary clusters, the staminate fls. more numerous and on slenderer pedicels: fr. globose, white, ⅛–⅓ in. across. India to trop. Austr. For cultivation in trop. regions or in the hothouse.
Alfred Rehder.

SEDGE. Consult *Carex* and *Cyperus*.

SÈDUM (Latin, *sedes*, to sit: the plants fix themselves on rocks and walls). *Crassulàceæ.* Sedum is a large group of fleshy-leaved herbaceous plants, mostly hardy and perennial, including the Stonecrop and Live-forever. The flowers are usually small, rarely ½–¾ in. across, but the clusters are often showy and 3–4 in. in diameter. There is a pretty blue-flowered species and one with scarlet flowers, but with these exceptions the genus might be divided into two groups, those with yellow flowers and those with white or pinkish flowers. The foliage is always succulent, but otherwise remarkably varied: the leaves opposite, alternate or whorled, entire or serrate, rarely deeply cut, sometimes large, broad and flat, sometimes thick and pulpy, sometimes minute and moss-like. Some of the plants are stout, erect and bushy, but many of them have a set of creeping barren shoots, terminated by dense rosettes, while the flowering stems are erect and often furnished with leaves of an entirely different shape.

Sedum is a genus of about 120 species, all found in the temperate and frigid regions of the northern hemisphere except a solitary species in Peru. Herbs, rarely shrubby at the base, glabrous or glandular-pubescent: flowers in cymes; petals 4–5 (rarely 6–7); stamens 8–10 (rarely 12–14). The genus is closest to the Houseleek and other species of Sempervivum, but the floral parts of Sedum are typically in 4's or 5's, while those of Sempervivum are typically 6 or more. Also Sempervivum extends to South Africa. The hardy Sedums are monographed by M. T. Masters in Gardeners' Chronicle for 1878. Masters' arrangement has been followed below. There is also a good horticultural review in Gn. 27, pp. 314–316 (1885).

Sedums are of the easiest culture. As a rule, they prefer sandy soil, and are very averse to a wet position in winter. They are standard plants for carpeting poor and sandy waste places where few other things will grow. The little yellow-flowered plant with pulpy foliage that spreads in nearly every cemetery is *Sedum acre.* Sedums are also general favorites in all forms of rock-gardening. They are much used for carpet-bedding, especially the kinds with mealy or glaucous foliage, and those with various metallic shades of purple. In the hardy border, the more robust and bushy kinds, like *S. maximum* and *spectabile*, are preferred, though any of the lower-growing kinds are suitable for edgings and any of the evergreen kinds are welcome in winter when the hardy border shows few other bits of color or signs of life. As a rule, Sedums like the sun, but a few of the species may help to solve the difficult problem of carpeting the ground underneath the trees where the soil is dry and shaded. Sedums are also favorites for baskets and vases, especially the kinds with trailing stems and minute leaves. For greenhouse decoration, *S. spectabile* is the favorite, as it is perhaps the showiest of the genus. It may be had in flower at any season of the year and remains in bloom a long time. It is also one of the favorite Sedums for window-sills, balconies and housetops, especially in crowded cities. *Sedum acre*, however, is everybody's plant. A pot of it is often the only pleasant sight in an ugly city alley. Sedums are plants for poor folks. The chief points against them are that they have never been fashionable and anybody can grow them. They can be propagated by seeds, but they are easily multiplied by the young offsets. These rosettes are somewhat bulb-like in nature and Sedums could probably be propagated if it were worth while by using each leaf of a rosette.

The key to the species is necessarily unsatisfactory. It would answer better for wild plants. In the gardens the species run together, especially those of the Telephium group, Nos. 7–10. There is no absolute proof that these and other Sedums intercross in the gardens, although it is practically certain. Although the species may run together, it has been thought best to take clear-cut types and to make the key as sharply defined as possible instead of giving generalized descriptions through which the plant lover may search in vain for distinguishing marks.

INDEX.

acre, 28.
Aizoon, 4.
album, 10, 34.
Anacampseros, 22.
Asiaticum, 2.
atropurpureum, 9.
aureum, 28, 33.
azureum, 21, 38.
brevifolium, 32.
cæruleum, 38.
carneum, 26.
cristatum, 24.
cruciatum, 35.
dasyphyllum, 30.
elegans, 28.
Ewersii, 21.
Fabaria, 7, 10.
Formosanum, 37.
hæmatodes, 9.
Hispanicum, 31.
hybridum, 7, 17.
Japonicum, 18.
Kamtschaticum, 16.
Lydium, 33.
macrophyllum, 18.
majus, 28.
Maximowiczii, 5.
maximum, 9.
Middendorffianum, 3.
Monregalense, 35.
monstrosum, 24.
Nevii, 14.
obtusatum, 12.
oppositifolium, 20.
populifolium, 15.
pulchellum, 27.
purpurascens, 7.
purpureum, 7, 10.
reflexum, 24.
Rhodiola, 1.
robustum 24.
roseum, 1, 10.
rubrum, 7.
sarmentosum, 26.
Selskianum, 6.
sempervivoides, 36.
sexangulare, 29.
Sieboldii, 23.
spathulatum, 11.
spathulifolium, 11.
spectabile, 10.
spurium, 19.
stenopetalum, 25.
stoloniferum, 19.
Telephium, 7.
telephoides, 8.
ternatum, 13.
Turkestanicum, 21.
variegatum, 9, 18, 23.
villosum, 39.

SECTION I. HERBACEOUS PERENNIALS, *i. e., plants that die down to the root during winter.* (*In greenhouse culture some become evergreen.*)

A. *Flowers unisexual*............ 1. **roseum**
AA. *Flowers bisexual.*
B. *Lvs. narrow.*
C. *Arrangement of lvs. opposite*.................... 2. **Asiaticum**
CC. *Arrangement of lvs. alternate.*
D. *Height about 4 in*...... 3. **Middendorffianum**
DD. *Height 12 in. or more.*
E. *Stems glabrous.*
F. *Sepals equal*...... 4. **Aizoon**
FF. *Sepals unequal*... 5. **Maximowiczii**
EE. *Stems pilose* .... 6. **Selskyanum**
BB. *Lvs. broad: roots tuberous.*
C. *Arrangement of lvs. scattered* (*rarely opposite in S. Telephium*).
D. *Margin of lvs. dentate.* 7. **Telephium**
DD. *Margin of lvs. nearly entire*............... 8. **telephoides**
CC. *Arrangement of lvs. opposite* (*sometimes in 3's in S. spectabile*).
D. *Buds obovoid, abruptly pointed* .... 9. **maximum**
DD. *Buds long and pointed.*10. **spectabile**

SECTION II. EVERGREEN PERENNIALS. *Foliage does not die during the winter.*

A. *Foliage flat, broad and relatively thin: lvs. spatulate or wider.*
B. *Lvs. in tufts or rosettes* (*at least those of the barren shoots*).
C. *Fls. yellow: anthers yellow.*
D. *Each fl. ½ in. across*..11. **spathulifolium**
DD. *Each fl. ¼ in. across*..12. **obtusatum**
CC. *Fls. white; anthers reddish.*
D. *Barren shoots with lvs. in 3's*...............13. **ternatum**
DD. *Barren shoots with scattered lvs.* ....14. **Nevii**
BB. *Lvs. scattered, i.e., not tufted.*
C. *Stem erect: fls. whitish or pinkish*.................15. **populifolium**
CC. *Stems* (*barren ones*) *prostrate.*
D. *Fls. yellow.*
E. *Margin of lvs. coarsely toothed above the middle.*
F. *Petals lanceolate*..16. **Kamtschaticum**
FF. *Petals linear*.....17. **hybridum**
EE. *Margin of lvs. entire.*18. **Japonicum**
DD. *Fls. pink, rose or white.*
E. *Arrangement of lvs. opposite.*
F. *Base of lvs. narrowed*...........19. **stoloniferum**
20. **oppositifolium**
FF. *Base of lvs. cordate* ....21. **Ewersii**
EE. *Arrangement of lvs. alternate*..........22. **Anacampseros**
EEE. *Arrangement of lvs. in 3's*.............23. **Sieboldii**
AA. *Foliage more or less terete: lvs. usually linear, not wider than lanceolate* (*unless in No. 28*).
B. *Apex of lvs. sharply pointed.*
C. *Fls. yellow.*
D. *Inflorescence decurved.*24. **reflexum**
DD. *Inflorescence not decurved.*
E. *Cymes scorpioid*....25. **stenopetalum**
EE. *Cymes umbellate*....26. **sarmentosum**
CC. *Fls. lilac or white*.......27. **pulchellum**
BB. *Apex of lvs. blunt.*
C. *Fls. yellow.*
D. *Lvs. ovoid, bitter*......28. **acre**
DD. *Lvs. oblong, tasteless*..29. **sexangulare**
CC. *Fls. white or pink.*
D. *Plants usually glaucous.*
E. *Anthers black*.......30. **dasyphyllum**
EE. *Anthers purple*......31. **Hispanicum**
EEE. *Anthers pink*........32. **brevifolium**
DD. *Plants not glaucous.*
E. *Fls. pinkish: buds 5-angled* ....33. **Lydium**
EE. *Fls. white: buds oblong* ....34. **album**
EEE. *Fls. white: buds roundish*..........35. **Monregalense**

SECTION III. ANNUALS OR BIENNIALS. *These die after flowering and fruiting. Annuals flower the first year, biennials the second.*

A. *Lvs. flat, not cylindrical.*
B. *Fls. scarlet*.................36. **sempervivoides**
BB. *Fls. yellow*.................37. **Formosanum**
AA. *Lvs. more or less cylindrical.*
B. *Fls. blue*...................38. **cæruleum**
BB. *Fls. dull rose or white* .....39. **villosum**

SECTION I. HERBACEOUS PERENNIALS (Species 1–10).

1. **ròseum**, Scop. (*S. Rhodiola*, DC.). Rootstock thick, fleshy, exhaling a perfume of rose water: height 6–8 in.: lvs. scattered, oblong, 1 x ¼ in.: fls. greenish or reddish purple, in a terminal flat-topped cyme about 1 in. across; petals 4; stamens 4 in the male fl., absent in the female; carpels in the female fl. 4. Summer. Eu., N. Amer., Himalayas.—The only species here described that has unisexual flowers. A neat-growing plant suitable for rockeries or the front row of borders.

2. **Asiáticum**, Spreng. Height 6–12 in.: lvs. opposite, linear, coarsely and irregularly toothed: fls. greenish yellow, in compact, globose cymes, floral parts in 5's. Summer. Himalayas.—Cultivated abroad and possibly in America. Its almost pinnatifid foliage makes it very distinct. In India it is said to have red flowers. It seems to suffer from the wetness of an ordinary border in winter, and should probably be wintered under glass.

3. **Middendorffiànum**, Maxim. Lvs. alternate, oblanceolate, dentate toward apex: fls. yellow, in a flat-topped cyme. Summer. Amurland.—According to J. W. Manning, it grows 4 in. high, and has deep green foliage which becomes a rich purple in winter. Woolson says it is densely tufted.

4. **Aizòon,** Linn. Height 1 ft. or more, usually 1½–2 ft.: lvs. alternate, oblong-lanceolate, coarsely and irregularly toothed for the greater part of their length, 2½ x ¾ in.: fls. yellow, ½ in. across, in a loose, panicled cyme 1–3 in. across. Late summer. Siberia.—An old garden favorite, suitable for the hardy border and for rockeries.

5. **Maximòwiczii**, Regel. Height 1 ft.: lvs. subopposite or alternate, oblong-ovate or oblong-lanceolate, regularly toothed: fls. yellow, in a dense, flat cyme. July, Aug. Japan, Amurland. Gn. 19, p. 203; 27, p. 316.—By some this is considered a variety of *S. Aizoon*. It is similar to *S. Aizoon* in habit but larger, differing in the sepals of unequal length and in the peculiar flask-shaped fl.-buds, which are dilated below and narrowed into a long beak above. Desirable for borders; also used for carpet beds. Seeds, as well as plants, are offered.

6. **Selskiànum**, Regel. Also spelled *Selskyanum*. Height 12–18 in.: lvs. alternate (?), serrate in the distal third: fls. yellow, nearly 1 in. across, in a hollow-topped, leafy cyme. Late summer. Amur., Manchuria.—Resembles *S. Aizoon* but has narrower and pilose leaves. Offered in 1893 by John Saul.

7. **Teléphium**, Linn. ORPINE. LIVE-FOREVER. Fig. 2282. Height 12–18 in.: lvs. scattered, rarely opposite, oblong-ovate, obtuse, dentate: fls. pink, spotted red, or

sometimes pure white, in dense, terminal and lateral subglobose cymes. July, Aug. Eu., N. Asia. Gn. 27, p. 316.—Naturalized in America, where it spreads much but blooms little. Vars. **hybrìdum, purpùreum** and **rùbrum** are live American trade names representing forms with dark purple foliage, the last-named variety being said to retain its purple color all summer. All the forms are suitable for the front rows of borders and for rockeries. The young shoots in spring are pretty objects and differ with the different varieties. The larger forms with bright fls. are preferable. *S. purpureum* and *purpurascens*, Koch, are varieties of *S. Telephium*. Subspecies **Fabària,** Masters (*S. Fabària*, Koch, not Hort.). This is regarded by Masters as a subspecies of *S. Telephium*, with lvs. narrower than in the type, the cymes always terminal and shorter peduncled: fls. smaller and earlier; petals less recurved. It is doubtful whether this is really in the trade. See *S. spectabile*.

2282. Live-forever—Sedum Telephium (× ½).

8. **telephoìdes,** Michx. Height 6–12 in.: lvs. scattered, 2 x 1 in., oblong-obovate, nearly entire or sparingly toothed: fls. flesh-colored, in small dense cymes 1–1½ in. across. June. Alleghanies from Md. south.—Offered 1891–92 by H. P. Kelsey.

9. **máximum,** Suter. A stout, bushy plant 2 ft. or less high, with either green or purple stems: lvs. opposite, ovate-acute, more or less cordate, crenate-dentate: cymes terminal and lateral on long peduncles, forming a loose panicle: petals whitish, spotted red towards tip. Aug.–Oct. Eu., Caucasus, northwestern Asia. Gn. 27, p. 316. — Var. **variegàtum,** Hort., has gold and green foliage, according to J. W. Manning. F.S. 16:1669 (as var. *versicolor*) shows a form with rosy purple stems: lvs. green, yellow and white, margined rosy purple. This species has many forms, the stems green or purple, fls. green or reddish, lvs. cordate or tapering at the base, spreading or recurved, variegated or not. It is the best for borders, but in the autumn is apt to get too straggly and needs support.

Var. **hæmatòdes,** Mast. Stems 2–2½ ft. high, deep purple: lvs. 5 x 3 in., oblong-ovate, obtuse, coarsely and irregularly toothed, purplish: petals whitish, tipped red. September. Here belongs *S. atropurpùreum*, Hort., according to Masters, but the plant or plants passing as such in America are very different. *S. atropurpùreum*, Turcz., which appears as a good species in Index Kewensis, is probably a synonym of *S. roseum*.

10. **spectábile,** Bor. (*S. Fabària*, Hort., not Koch). Showy Sedum. Fig. 2283. This is the most popular of all Sedums and is used for the greatest variety of purposes. Robust, glaucous, 1½–2 ft. high: lvs. opposite or in 3's, 3 x 2 in., ovate, obtuse, entire or obscurely wavy-toothed: fls. ½ in. across, in flat-topped, inversely pyramidal, leafy, umbellate cymes 4 in. across. Sept., Oct. Possibly from Japan. Gn. 27, p. 315. I. H. 8:271.—The fls. vary from rose to purple and perhaps to white. Pitcher & Manda offered var. **álbum.** Var. **purpùreum** and **ròseum** are trade names. Also a form with variegated foliage has been advertised. This species remains in bloom a long while and is very attractive to butterflies. Masters declares that it thrives in stiff clay, and does not do so well in lighter soils.

2283. Showy Sedum—Sedum spectabile.
Clusters 4 inches across.

Section II. Evergreen Perennials (Species 11–35).

11. **spathulifòlium,** Hook. Barren stems creeping, with terminal rosettes of obovate lvs.: flowering branches erect, and bearing scattered club-shaped lvs.: fls. yellow, ½ in. across, in terminal cymes; sepals oblong-obtuse. May, June. N. W. Amer. G.C. II. 10:377. Gn. 24:415.—Offered in 1881 by Gillett, but is probably not cult. in eastern states, and probably requires pot culture indoors. Here may belong Franceschi's *S. spathulatum*, a California species, which he calls a "giant among Sedums, growing several ft. high." Masters' plant is not over 1 ft. high.

12. **obtusàtum,** Gray. Barren stems prostrate, with rosettes of spatulate lvs.: fl.-stems erect, ultimately leafless and then scarred: fls. yellow, in terminal, umbellate cymes 1½–2 in. across; sepals oblong-acute. June, July. Calif.—Once offered in America, but probably not now in cult.

13. **ternàtum,** Michx. Fig. 2284. Barren stems prostrate, with terminal rosettes of spatulate lvs.: lvs. of the flowering branches scattered, oblong, acute, all the lvs. in whorls of 3: fls. white, ½ in. across, in terminal, leafy, 1-sided, 3–5-parted cymes; floral parts in 4's. July, Aug. Pa. to Ill. and south. B.M. 1977. B.R.2:142.

14. **Nèvii,** Gray. Barren stems prostrate, with terminal rosettes of obovate-spatulate lvs., tapering into a short stalk auricled at the base, sprinkled with pink dots: fl.-stems erect, with appressed, scattered lvs. similar to, but smaller than those of the barren stems: fls. white, ½ in. across, in forked cymes whose branches are about 1⅓ in. long and recurved; anthers brownish purple. July. Mts. of Va. and Ala.—Hardy in Mass. and desirable for edgings or rockeries, according to Edward Gillett.

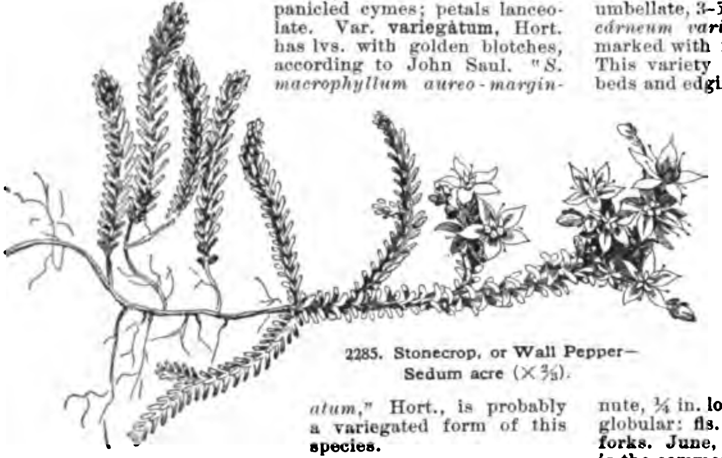
2284. Sedum ternatum (× ⅓).

15. **populifòlium,** Pall. A very distinct species by reason of its shrubby base, stalked, poplar-shaped lvs. and corymbs of whitish fls. which have the scent of hawthorn. Roots fibrous: stems 6–10 in. high, branched: lvs. alternate, ovate, acute, coarsely and irregularly toothed: fls. nearly ½ in. across, whitish or pinkish, in corymbose cymes; stamens pinkish; anthers purple. Aug. Siberia. B.M. 211. Gn. 27, p. 316. R.H. 1857, p. 150.—Rare in cult., but desirable for borders and rockeries and makes a charming pot-plant.

16. **Kamtschàticum,** Fisch. & Mey. Height 4–6 in.: lvs. alternate or opposite, obovate, coarsely, but regularly toothed above the middle: fls. yellow, ¾ in. across, in umbellate cymes 1–3 in. across; petals lanceolate. Late summer. E. Asia. Gn. 25, p. 531; 27, p. 317.

17. **hybridum**, Linn. Creeping, glabrous or glandular: lvs. alternate, stalked, spatulate, coarsely toothed in the upper half: fls. yellow, in umbellate cymes 2–3 in. across; petals linear. Summer. Siberia.

18. **Japónicum**, Siebold. Diffuse: lvs. scattered or opposite, spatulate, acute, entire: fls. yellow, ½ in. across, in terminal and lateral panicled cymes; petals lanceolate. Var. **variegàtum**, Hort. has lvs. with golden blotches, according to John Saul. "*S. macrophyllum aureo-marginatum*," Hort., is probably a variegated form of this species.



2285. Stonecrop, or Wall Pepper—Sedum acre (× ⅔).

19. **stoloniferum**, Gmelin (*S. spùrium*, Bieb.). Barren stems trailing, marked with annular scars, rooting at nodes: fl.-stems ascending 6 in. high: lvs. opposite, spatulate, coarsely toothed above, the margins studded with hyaline papillæ: fls. pink (or white), ¾ in. across, in cymes 2 in. across; anthers reddish. July, Aug. Asia Minor, Persia. B.M. 2370. Gn. 27, p. 315. R.H. 1891, p. 523.—Commoner in cult. abroad. "It has the disadvantage of affording cover for snails," but "one always knows where to look for the snails."

20. **oppositifòlium**, Sims. Very close to *S. stoloniferum*, but the lvs. are brighter green, more regularly decussate, and as they are broader at the base they overlap one another a little and produce a neater appearance than in *S. stoloniferum*. Fls. white or whitish. Anthers orange, according to Masters, but yellow in B.M. 1807. Aug. Caucasus, Persia.

21. **Éwersii**, Ledeb. (*S. azùreum*, Royle, not Desf.). Stock thick, giving off many trailing or ascending slender branches: lvs. opposite, sessile, cordate, clasping, entire or slightly wavy: fls. pink or pale violet, in dense globose cymes. Aug., Sept. Himalayas, Siberia.—Masters says it is rather tender in cult., but well worth pot culture. Var. **Turkestánicum**, Hort., according to J. W. Manning, grows 4 in. high, has deep violet fls. in Sept. and Oct., and is hardy in Mass.

22. **Anacámpseros**, Linn. Glaucous, barren branches rooting at nodes: fl.-stems erect, reddish: lvs. bluish green, orbicular or obovate-obtuse, cordate, auricled, greenish with reddish margins: fls. violet, ¼ in. across, in dense, globose cymes. Central Eu. B.M. 118.—Suitable for rockeries and edgings. The fls. are comparatively rarely produced.

23. **Sièboldii**, Sweet. Glaucous, 9 in. high: branches purplish, erect, afterwards decurved: lvs. in whorls of 3, sessile, sinuate, bluish green, pinkish at margins: fls. pinkish, ½ in. across. Aug. Japan. B.M. 5358.—Very useful for rockeries and borders. Var. **variegàtum**, Hort. (*S. variegàtum*, Hort., not Wats.). has lvs. marked with white. I.H. 10:373 (green at margin, yellow down center).

24. **refléxum**, Linn. Glabrous, barren stems trailing: fl.-stems 8–10 in. high: lvs. in 6–7 rows, crowded on the barren stems into a conical mass, ½–¾ in. long, linear: inflorescence decurved or erect before flowering: fls. ¾ in. across, yellow, floral parts in 4's to 8's. England. Var. **cristàtum**, Mast. (*S. monstrosum* and *robustum*, Hort.), has fasciated stems forming a crest like a cockscomb.

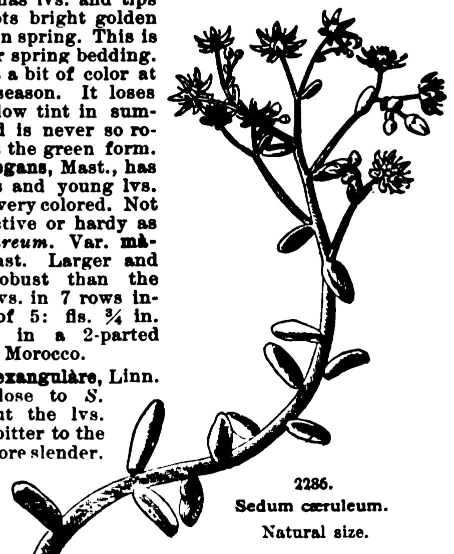
25. **stenopétalum**, Pursh. Glabrous: stems 3–6 in. high, erect from a decumbent base: lvs. crowded on barren shoots, sessile, fleshy, lanceolate, ½ in. long: fls. bright yellow, in scorpioid cymes, floral parts in 5's. Rocky Mts.—Offered by Gillett in 1881. Rare in cult.

26. **sarmentòsum**, Bunge. Glabrous: lvs. opposite or whorled, linear: fls. yellow, ¼ in. across, in a flat-topped, umbellate, 3–5-forked cyme. China.—Var. **cárneum** (*S. cárneum variegàtum*, Hort.), has pink stems: lvs. marked with marginal stripe of white or cream-color. This variety is grown in greenhouses and for carpet beds and edgings.

27. **pulchéllum**, Michx. Glabrous trailer, 3–6 in. high: lvs. linear, terete-pointed, gibbous at base, scarcely ½ in. long: fls. rosy purple, ½ in. across: inflorescence a 3–4-branched cyme, with erect fls. crowded in 2 rows along the upper surface and each provided with a leafy bract. June–Aug. U. S. B.M. 6223. Gn. 27, p. 315. G.C. II. 10:685.—The minute foliage assumes rich tints of red, brown and purple. The branches of the inflorescence are 3–4 in. long and gracefully arched.

28. **àcre**, Linn. STONECROP. WALL PEPPER. LOVE ENTANGLE. Fig. 2285. Barren stems creeping, branched, about 2 in. long: fl.-stems 2–3 in. high: lvs. minute, ¼ in. long or less, crowded, thick, ovoid or nearly globular: fls. ½ in. across, in 1-sided cymes having 2–5 forks. June, July. Eu., E. Asia. Gn. 27, p. 316.—This is the commonest species native to England and one of the commonest in cultivation. It is much used for edging and carpeting bare spots, especially in cemeteries. Thrives best in poor soil. The lvs. have an acrid taste. Masters says it may often be seen on the window-sills of London alleys, and adds: "It is one of the commonest, least considered of all plants, but very few have really higher claims to notice." Var. **aùreum**, Mast., has lvs. and tips of shoots bright golden yellow in spring. This is cult. for spring bedding. It gives a bit of color at a dull season. It loses the yellow tint in summer and is never so robust as the green form. Var. **élegans**, Mast., has the tips and young lvs. pale silvery colored. Not as effective or hardy as var. *aureum*. Var. **màjus**, Mast. Larger and more robust than the type: lvs. in 7 rows instead of 5: fls. ¾ in. across, in a 2-parted cyme. Morocco.

29. **sexangulàre**, Linn. Very close to *S. acre* but the lvs. not so bitter to the taste, more slender, several times as long as thick, and in 6–7 rows, rather than 5. Europe, rarer. In American gardens it is said to grow 6 in. high, and flower in June and July.—Mostly used for carpet beds.



2286. Sedum cæruleum. Natural size.

30. **dasyphýllum**, Linn. Glaucous, glabrous or glandular: lvs. oblong or roundish, studded with crystalline pimples: buds oblong, obtuse: fls. pinkish; anthers black. Eu., S. Afr. B.M. 6027.—Woolson says it grows 3–6 in. high, and is suitable for edgings.

31. **Hispánicum**, Linn. Glaucous: fl.-stems 3–4 in. high, reddish: lvs. ¼ in. long, linear, greenish gray, becoming reddish, studded with fine hyaline pimples at

the tips: cymes 3–7-branched, umbellate: buds 5–6-angled: fls. pinkish white, ⅓ in. across. July. Central and southern Europe.—Readily distinguished by having the floral parts in 6's.

32. **brevifòlium**, DC. Glaucous: lvs. in 4 rows, a tenth of an inch long, pinkish, densely covered with a mealy pubescence: fls. ¼ in. across; petals white, with pink midrib; anthers pink. Western Mediterranean region.—Manning says it grows 4 in. high and blooms in July and August. Said to be exceptionally sensitive to superfluous moisture at the root.

33. **Lýdium**, Boiss. Glabrous, 3–6 in. high: lvs. ¼ in. long, linear, greenish or red-tipped, auricled at base and with numerous pimples at tip when seen with a lens: buds 5-angular: fls. one-tenth in. across, pinkish; anthers reddish. Aug., Sept. Asia Minor.—Var. **aùreum**, Hort., was offered by John Saul in 1893.

34. **álbum**, Linn. Glabrous, 4–6 in. high: lvs. alternate, ⅓ in. long, linear-oblong: cymes 2–3 in. across: buds oblong: fls. ⅓ in. across, white; anthers reddish. July. Eu., N. Asia. Gn. 27, p. 315.

35. **Monregalénse**, Balbis (*S. cruciàtum*, Desf.). Glabrous, except inflorescence, which is glandular: lvs. linear: fls. ¼ in. across, white; buds roundish, pointed; stamens pinkish. N. Italy, Corsica. L.B.C. 5:464.

SECTION III. ANNUALS OR BIENNIALS (Species 36–39).

36. **sempervivoides**, Fischer. SCARLET STONECROP. One of the showiest in the genus and remarkably distinct, if not unique, by the color of the fls. Habit of a house-leek, 4–8 in. high: lvs. 40–50 in a rosette, wedge-shaped: lvs. of fl.-stems clasping, greenish red, oblong, acute: cymes 2–4 in. across, dense: fls. scarlet. July. Asia Minor. Gn. 19:378. R.H. 1846:5.—Seems not to be offered in America.

37. **Formosànum**, N. E. Br. Height 6 in.: stem repeatedly branched in a dichotomous or trichotomous manner: lvs. 1–3, in whorls at branchings of stem, with occasionally 1–3 on internodes, flat, spatulate: fls. yellow. Formosa. Int. into S. Calif. in 1900.

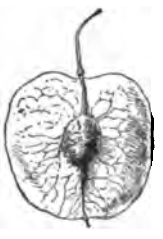
38. **cærùleum**, Linn. (*S. azùreum*, Desf., not Royle). Fig. 2286. Glabrous, or pilose on inflorescence, 2–3 in. high: lvs. ¼ in. long, oblong-obtuse, pale green, spotted red: cymes 1 in. across, with recurved branches: fls. ¼ in. across, pale blue, 5–7-merous. S. Afr. B.M. 2224. B.R. 6:520. Gn. 27, p. 315.—Carpet beds. Sandy soil.

39. **villòsum**, Linn. Glandular-pubescent, 3–4 in. high, with no barren branches: lvs. 2–5 times as long as thick: fls. few, dull rose (or white according to Masters) in a small, loose cyme. Bogs and stony rills, mountains of Eu.—This is one of the very few that prefer wet feet. The white-fld. form is advertised by one dealer in perennials. The species, however, is an annual.

2288. Natural planting of maple seeds.

S. Braùnii, offered by Krelage, Haarlem, Holland, appears not to be recognized by botanists.—*S. Calábricum* is a name given without description to an Italian species, which is still offered by Krelage.—*S. débile*, Watson, an American species, was offered in 1881 by collectors, but is probably not in cult. anywhere.—*S. Doúglasii*, Hook., is a yellow-fld. species from Oregon which is now offered in the East, but is probably not cult. in Eu. It grows 4 in. high, and flowers from June until Aug. Said to be annual. Lvs. lanceolate, ¼–⅜ in. long, acute.—*S. Oregànum*, Nutt., was offered by collectors of western American plants in 1881, but is not known to be cult.—*S. speciòsum*, Hort.=?—*S. tectòrum*, Scop.=Sempervivum tectorum.—*S. trífidum*, Wall., is not offered in America, but should be in every fancier's collection. It is immediately distinguished from all others described above by the pinnatifid foliage, which is massed at the top of the stems and makes a fine setting for the clusters of fls., being twice as wide as the latter. Height 1 ft.: fls. purplish, red or crimson. Himalayas. Gn 27, p. 317.

W. M.



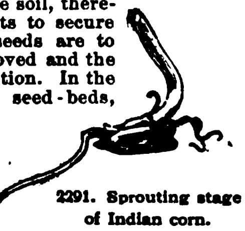
2287. Seed-like fruit of Hop-tree. Natural size.

2289. Sprouting stage—Castor Bean.

SEEDAGE. Under this term may be included all knowledge respecting the propagation of plants by means of seeds or spores. The word was first used, so far as the writer is aware, in 1887. It is equivalent to the French *semis*, and is comparable with the words graftage, layerage and cuttage. In general literature and common speech, a seed is that part of the plant which is the outcome of flowering and which is used for propagating the species. In the technical or botanical sense, however, the seed is the ripened ovule. The seed contains an embryo, which is a miniature plant. The embryo has one or more leaves (cotyledons), a bud or growing point (plumule) and a short descending axis (caulicle). From the caulicle or stemlet, the radicle or root develops. This embryo is a minute dormant plant. Each embryo is the result of a distinct process of fertilization in which the pollen of the same or another flower has taken part. The ovule is contained in the ovary. The ripened ovary is the seed-case or pericarp. The pericarp, with the parts that are amalgamated with it, is known technically as the fruit. In many instances there is only one seed in the fruit; and the seed and its case may adhere and form practically one body. Many of the so-called seeds of horticulturists are really fruits containing one or few seeds. Such are the seeds of beet, lettuce and sea-kale. The winged seeds of elms, hop-tree (Fig. 2287) and ashes are really fruits containing a single seed. Acorns, walnuts, butternuts and chestnuts are also fruits; so are grains of corn, wheat, and the "seeds" of strawberry. The keys of maple are double fruits, with two seeds (Fig. 2288). Beans and peas are true seeds. The fruit part is the pod in which they are borne. Seeds of apples and pears are also true seeds, the fruit being the fleshy part that surrounds them. Germination is the unfolding and the growing of the dormant or embryo plant. The first visible stage in germination is the swelling of the seed. Thereafter the integument is ruptured, and the caulicle appears. When the caulicle protrudes, the seed has sprouted; and this fact is taken as an indication that the seed is viable (Fig. 2289). Germination is not complete, however, until the young plant has made vital connection with the soil, has developed green assimilative organs and is able to support itself (Fig. 2290). See, also, Figs. 2291 and 2292. Seeds that have sufficient life to sprout may still be too weak to carry the process to complete germination. The ideal test for the viability of seeds is to plant them in soil in conditions that somewhat nearly approach those in which they are finally to be planted. This test eliminates the seeds which are very weak and are not able to grow under ordinary conditions and to push themselves through the soil. The sprouting test made in a specially prepared device, in which all conditions are regulated to a nicety, may be of the greatest value for purposes of scientific study and investigation and for the making of comparative tests between various samples, and the greater the sprouting test, the greater the germinating power; but one must not expect that the actual germination will always be as great as the percentage of sprouting. In many cases, the differences in results between the sprouting test in a specially prepared device, and the germination tests in well-prepared soil in the open, may be as great as 50 per cent. Viability varies with seasons and other conditions. While it is true as a general statement that the older the seed the less the viability, yet the reverse may be true within narrow limits. Sometimes lettuce and melons that germinate only 50 per cent in December, germinate 70–80 per cent in April.

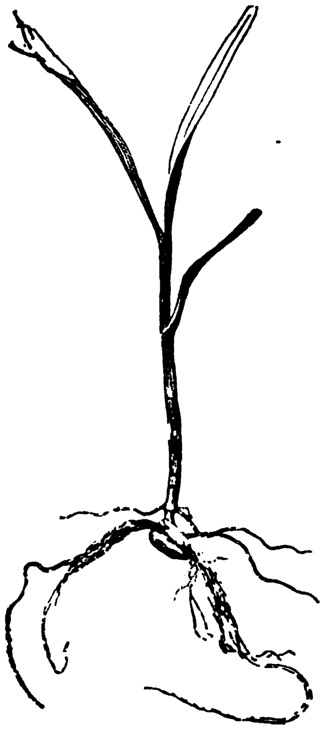
In order that seeds shall germinate, they must be supplied with moisture and be given a definite temperature. The requisite temperature and moisture vary with the different kinds of seeds, and they are to be determined only by experience. Seeds may be planted in any medium which supplies these requisite conditions. Although seeds are ordinarily planted in the ground, such practice is not necessary to germination. They may be planted in cocoanut fiber, moss or other medium. However, the ground may supply the requisites for germination, and it also supplies plant-food for the young plantlet when it begins to shift for itself; and, furthermore, the plants are in the position in which they are desired to grow. In the case of many seeds, germination is more rapid and certain when the seeds are sown in cocoanut fiber or other medium, for the conditions may be more uniform. As soon as germination is fairly complete, the plants are transplanted to the soil. The depth at which seeds shall be sown depends on many conditions. Out of doors they are planted deeper than in the house, in order to insure a uniform supply of moisture. A depth equal to twice the diameter of the seed is an old gardeners' rule. This applies well to the sowing of most seeds under glass when the soil is well prepared and is kept watered, but in the open ground three to four times this depth is usually necessary. The finer and moister the soil, the shallower the seeds may be planted, other things being equal. Better results in germination are secured when the seeds are sown in a specially prepared seed-bed. The conditions may then be better, the gardener is able to protect the young plants from cold and from insects and fungi, and he is enabled also to economize time and labor. In transplanting from the seed-bed to the field, the gardener unconsciously chooses only the best plants and thereby the crop is improved. The seed-bed may be in a forcing-house or hotbed, or in the open. If it is in the open, it should be near the buildings, where it can be visited frequently and where water may be applied as needed. If the bed is to be used late in the season when the soil is naturally dry, it is well to cover it the previous spring or fall with a very heavy coating of manure. This retains the moisture, and the leaching from the manure adds plant-food to the soil, thereby enabling the young plants to secure an early start. When the seeds are to be sown, the manure is removed and the surface is then in ideal condition. In the handling of young plants in seed-beds, one must take pains that the plants are not too thick and that they do not suffer for light, else they may become "drawn" and be practically worthless. In greenhouses and hotbeds, it is well to handle common vegetables and flower seeds in gardeners' flats (Fig. 2293). These flats are easily handled, and the soil is so shallow that it can be kept in uniform conditions of temperature and moisture. The seeds of some of the finer and rarer kinds of ornamental plants require special treatment. These treatments are usually specified in the articles devoted to those plants. Details of the handling of very delicate seeds are well discussed in the article on *Orchids*.

2290. Germination complete —Castor Bean.



2291. Sprouting stage of Indian corn.

As a rule, seeds germinate best when they are fresh, that is, less than one year old. Some seeds, however, of which those of melons, pumpkins and cucumbers are examples, retain their vitality unimpaired for a number of years, and gardeners do not ask for recent stock. Seeds of corn salad should be a year old to germinate well. Very hard, bony seeds, as of haws and viburnums, often do not germinate until the second year. In the meantime, however, they should be kept moist. Seeds of most fruit and forest trees should be kept moist and cool, otherwise they lose vitality; yet if kept too moist, and particularly too close or warm, they will spoil. Nuts and hard seeds of hardy plants usually profit by being buried in sand and allowed to freeze. The freezing and the moisture soften and split the integuments. Sometimes the seeds are placed between alternate layers of sand or sawdust: such practice is known technically as stratification.
L. H. B.



2292. Germination complete in Indian corn.

Seed Breeding.—The marvelous industrial and commercial development which has characterized the latter part of the nineteenth century is nowhere more marked than in the art and practice of seed growing. Whatever may have been their intellectual belief, most planters have acted, up to within a few years, as if seed was indeed essential to the production of a crop, but only in the way that water and manure are essential. The only question was whether or not the seed would grow. It might be desirable that the seed all be of some particular kind so that the crop would ripen all at once, but beyond that the breeding of the seed was given very little consideration. It is only within a few years that a majority of even good cultivators have come to recognize in their practice the fact that the possibilities and limitations of a crop are as positively determined by the seed used as is the character of the fruit of an orchard by the trees of which it is composed. There have always been exceptional men, who fully appreciated the importance of seed selection and breeding, which they practiced within their own gardens to secure a supply for their own use, but even professional seedsmen formerly gave little heed to scientific seed breeding, being quite content to "rogue" out mixtures or poorer plants rather than to select and breed only from the best. Now, every seedsman who values his reputation maintains more or less extensive stock seed farms, where plant-breeding is conducted on the same principles and with the same sort of skill and care that is used in the breeding of animals.

The general method followed is first to form a clear conception of just what points or qualities give value to a variety and what a perfect plant of that sort should be. Then a few plants—say ten—which come as near this ideal as possible are selected and the seed of each saved separately. These separate lots are planted the next spring in contiguous blocks, and the plants given an opportunity for their most perfect development. As they approach maturity the lots are carefully examined, and if those in one or more blocks show either general inferiority or a large portion of inferior plants, the entire block is condemned and rooted out, even if in doing so some very fine individual plants are destroyed. The remaining blocks are then carefully examined and that one selected which shows the closest adherence to the desired type, and from it a few plants are selected and their seed saved separately for planting in blocks the succeeding year. Then the remaining plants of this and the other blocks which escaped the first weeding out are very carefully examined and all inferior ones removed, and the seeds from the plants which still remain are saved together. These are usually sufficient in quantity to plant a field, the product of which is used by the seedsman for his general stock seed. From the stock seed he grows the seed which he offers his customers. The same process is repeated every year, or at least every few years, and results in marked improvement, if not in type, at least in the fixing and making permanent the good qualities of the variety. Having thus obtained stock seed which is of superior quality and sure to reproduce itself, the seedsman contracts with some farmer, located in a section where soil and climate are favorable to the best development of the sort, to plant a large field and save the entire seed product. This the farmer does with little regard to selection, taking pains only to guard against contamination from adjoining fields, and to remove any chance sports or mixtures that may appear. The seed thus produced is what the seedsman furnishes his customers. This plan enables the professional seedsman not only to produce cheaper seeds, but seeds of better quality than the ordinary planter can, or at least is likely to produce in his own garden, and in consequence gardeners have come to get more and more of their seed from the seedsman, whose business has correspondingly increased.

2293. A gardener's flat, or shallow box, in which seeds are sown and small plants handled.
A good size for a flat is 16 x 20 inches, and 3 inches deep.

In 1900 a single seed firm contracted for the growing of more than 200 acres of one variety of watermelon for seed, and received on its contracts over 30,000 pounds. More than half of this came from a single field of over 50 acres, and in this entire field there were not 50 fruits which were not good types of the variety. One could go to any part of it and gathering together the nearest 100 fruits would find that at least 50 of them were so nearly alike as not to be distinguished from one another; while of the remaining 50 at least 40 could be distinguished only by some mark that had resulted from accidental causes. The same firm had 20- and 40-acre fields of beans, peas, corn and other vegetables in which every plant was, as it were, the grandchild of some especially fine plant produced two years before, and which was itself the product of years of previous selection. Such seed is much more reliable than that produced in a small garden, where other plants of the same species are growing in near-by gardens and fields.

W. W. TRACY.

Seed Testing.—Scientific seed testing was inaugurated in 1869 by Dr. F. Nobbe, director of the Experiment Station at Tharand, Saxony, who was impressed by the large amount of impurities and the low germinating power of many commercial seeds, for which the German farmer was paying fancy prices. The publication of the results obtained by him excited much comment and laid the foundation for the present extensive system of European seed control. At the present time there are more than one hundred so-called seed control stations in Europe alone. Some of these are independent institutions, while others are conducted as branches of agricultural experiment stations.

The quality of seeds cannot be told by a mere casual inspection but is ascertained only by a careful test. This should include three steps: (1) an examination for *purity* (freedom from foreign matter), (2) *vitality*, and (3) *genuineness*, or trueness to name. The latter is known to seedsmen and growers as *purity of stock*. Unless seeds possess a high requirement in all of these respects their use will entail great loss to the planter.

Purity Test.—The percentage of purity is determined by weight, from a fair average sample of seed selected from different parts of the bulk lot. Wheat and other grains are taken with a sampler, consisting of two hollow cylinders of metal, one inside the other, and about 36 in. long by 1¼ in. in diameter. They are pointed at the bottom and contain a series of openings along one side, which may be turned at will to open or close the holes. The sampler, with the holes open, is thrust into the grain in the car or open bag for its entire length. When filled with seeds the inner cylinder is turned, so as to close the holes, and the sampler removed. For clover and other small seeds one uses a "trier," consisting of a single short cylinder open at one end and tapering down to a sharp point, just above which on one side is a long, elliptical opening (Fig. 2294). The trier is thrust through the side of a bag of seed at different points until the aperture is covered, the seed being allowed to run out at the other end into a dish.

2294. Clover seed "trier."

The seed thus taken is thoroughly mixed and a given quantity weighed out for testing. The amounts used in the purity test vary with the size of the seed, ranging from 15 grains of June grass, red top, and tobacco to 1.8 ounces of peas and cereals. If the sample is suspected to contain any seeds of such serious pests as dodder, Canada thistle, wild mustard, ergot, etc., at least 1.8 ounces are examined for such impurities.

After being weighed the seeds are spread out thinly on a sheet of heavy white paper or pane of glass and by means of a pair of forceps the impurities are removed. This includes *inert* matter, such as dirt, chaff, broken seeds and *foreign seeds*. Under the latter designation are embraced seeds of both weeds and useful plants, that is, any seeds of a different name from that under which the sample was sold. The impurities are weighed upon a good chemical balance and the percentage of impurity thus determined.

The purity which a given kind of first-class commercial seed should show depends largely upon the habit of growth of the species and the difficulty of obtaining pure seed of that species. Most vegetables and cereals are grown devoid of weeds, and their seeds are easily cleaned, hence they should be practically pure. Grasses and clovers, on the other hand, are more or less liable to be mixed with other species in the field. Furthermore, the cleaning of some varieties requires great care, often entailing a considerable loss of good seed, hence the proportion of pure seed to be expected in such samples is less than in the former case.

An extensive experience in testing commercial seeds, together with a comparison of the results of other tests made in this country and Europe, has enabled the United States Department of Agriculture to fix a table of standards of purity for most seeds sold by dealers. These standards, however, are subject to future revision if found necessary.

By means of a hand lens and by reference to a standard collection of economic seeds, the foreign seeds in the sample are next determined. If dodder, Canada thistle, ergot, wild mustard, bulbs of wild onion, chess, Russian thistle, cockle, quack grass, penny cress, wild oats, or wild flax are present the seed should be rejected; also if 1 per cent or more of weed seeds be found.

The reference collection of seeds should be kept in neatly labeled glass bottles, without necks, tightly stoppered and systematically arranged in shallow pasteboard boxes (see Fig. 2295). A convenient size for these bottles is 2 in. long by 3-5 in. in diameter. A tray holding 100 of such bottles should fit into an ordinary herbarium case. If the collection is large, a card index will be of great assistance in finding the specimens.

Germination Tests.—The seeds used in germination tests must be taken indiscriminately from pure seed which has been thoroughly mixed for that purpose. The selection of plump, nice-looking seeds for these tests, as frequently practiced, impairs the authenticity of the result.

Tests may be conducted in the laboratory between damp cloths or blotters, or in porous saucers, or in sand or soil in a greenhouse. Seeds which are known to germinate with difficulty should be tested in a greenhouse as well as in the laboratory. The same is true of any species of seed whose conditions of germination are not well understood.

While damp blotters serve as the best substratum under ordinary circumstances, and especially where a large number of tests are to be made, they do not answer as well for fine, slow-germinating seeds like tobacco and June grass, and many flower-seeds, owing to the fact that the blotters sometimes adhere too closely to permit the proper circulation of air. This may be remedied to a certain extent by placing narrow strips of glass between the folds, but main reliance in such cases should be placed upon soil tests.

All tests are to be made in duplicate, using two lots of 100 seeds each of peas, beans, corn, cucurbits and others of a similar size, and 200 seeds of clover, cabbage, lettuce, etc. The more seeds taken for test the less the chance of error. However, 5 per cent to 10 per cent of variation may be expected between the two lots of seed, even though they might have been taken from the same plant. In the case of a greater variation than 10 per cent the test should be repeated. Seeds upon which moulds form quickly are likely to be old stock.

The seeds should be inspected daily, a note being made of those having sprouted, which are then thrown out. In testing seeds of the pea family (Leguminosæ) one-third of those remaining hard and fresh at the close of the test are usually counted as having sprouted. The average of the duplicate tests is to be taken as the percentage of vitality. Averages should not be made, however, between results obtained by different methods, such as blotters and soil.

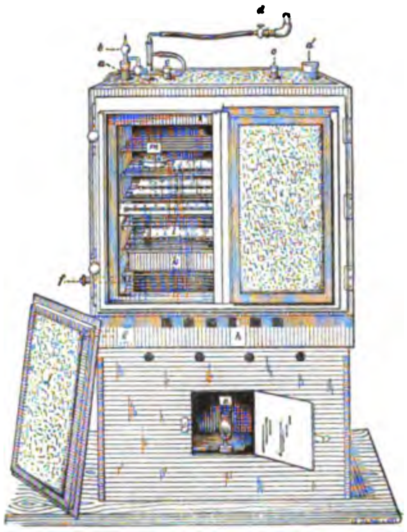
2295. Bottle similar to that used in U. S. Dept. Agric. for small seeds.

Laboratory tests are preferably made between damp blotters placed in a metal chamber heated by gas, the heat being controlled by a thermo-regulator. The blotters must be free from soluble chemicals. Blue blotters will be found less trying to the eye than white. The germinating chamber may be of any form which allows proper control of the conditions of light, heat, air and moisture. The standard chamber adopted by the association of American Agricultural Colleges and Experiment Stations was designed by the writer, and serves equally well for bacteriological purposes or experiments in plant physiology as for seed testing (see Fig. 2296).

It is made of 20-ounce corrugated copper, and is 2 feet long, 18 inches deep, and 2 feet high, outside measurements. The outside, except the bottom, is covered with two layers of felt, each ½ inch thick.

A water space is afforded by the double walls, which extend on all sides except the front and are 2 in. apart. Entrance to this water jacket is obtained at *a*, *á* (Fig. 2296), while the water can be drawn off at *g*. At *c*, *c*, on the top, and at *f*, near the bottom of one end, are 1-inch openings into the chamber. One of the upper openings may be used for the insertion of a thermometer, if desired. Owing, however, to the influence which the external atmosphere exerts upon thermometers whose tubes are partly exposed, provision has been made for holding two thermometers in a horizontal position, one on the inside of each panel of the door to the chamber, by means of hooks of stout copper wire (Fig. 2297, *a*, *a*).

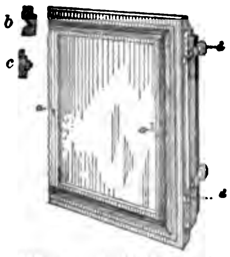
The door is made in 2 panels, each consisting of 2 plates of thick glass set about ½ in. apart in a copper frame, which is covered inside with felt. The inside margin of the door is provided with a projection (Fig. 2297, *c*) which fits snugly into a felt-lined groove (Fig. 2297, *b*), extending around the front side of the chamber. The door is 3 in. shorter than the front of the chamber, the remaining space being closed with copper and provided with a ventilator (Fig. 2296, *h*), which permits the exit of carbon dioxid, and can be closed tightly with a slide. Perfect closing of the door is further effected by a copper slide extending along the front margin, which catches firmly at the top and bottom of the chamber (Fig. 2297, *d*, *d*). This device, together with the groove and its corresponding projection, are adapted from the Rohrbeck bacteriological chamber. The outside door is furnished with a frame into which slide two plates of galvanized iron painted dead black inside and covered with felt (Fig. 2296, *i*, *j*). By this arrangement the interior of the chamber may be kept dark or exposed to light, or, if desired, one-half may be dark and the rest light, the other conditions remaining the same. By raising these slides the thermometers can be read without opening the door. Glass plates of various colors may be substituted for the slides, if the effects of different rays of light on plant-growth are to be studied.



2296. Standard seed-germinating chamber (front view, with one door slide removed).

Used by the United States Department of Agriculture and American Experiment Stations. *a*, *á*, openings into water jacket; *b*, thermo-regulator; *c*, *c*, openings into chamber; *d*, gas entrance tube; *e*, microbunsen burner; *f*, gas exit; *g*, water exit; *h*, ventilator; *i*, *j*, door slides; *k*, pan to hold porous saucers, etc.; *l*, blotter test; *m*, porous saucers with sand test.

Seven movable shelves, placed 2¼ in. apart, are held in place by copper ledges ¼ inch wide. These shelves are made of brass rods 1½ in. apart, and each one is capable of holding up 60 pounds weight. The temperature is controlled by a low-temperature thermo-regulator (Fig. 2296, *b*). A very low and equable flame is secured with a microbunsen burner (Fig. 2296, *e*). One of the openings into the water jacket (Fig. 2296, *a*) is 2 in. in diameter to admit a Roux thermo-regulator, if a very even temperature is desired, as in bacteriological work. Fresh air or different gases can be forced into the chamber at one of the openings at the top (Fig. 2296, *c*, *c*) and out at the bottom (Fig. 2296, *f*). Each of the openings at the end (Fig. 2296, *f*, *g*) is closed with a screw cap.



2297. One-half of door (inside view).

a, *a*, hooks for holding thermometer; *b*, section of groove in chamber into which fits *c*, projection on door; *d*, *d*, door fastener.

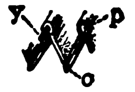
The chamber is provided with three tin-lined copper pans, each having a narrow ledge around the inside near the top, which serve to hold copper rods with folds of cloth, if the experimenter wishes to test seeds according to the Geneva pan method. The pans also serve to hold porous saucers or plates.

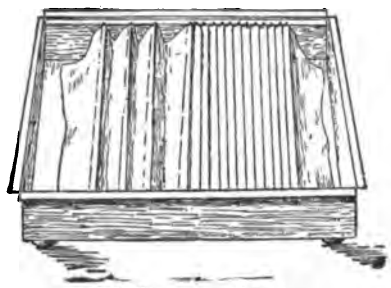
The chamber when empty weighs about 100 pounds, and is therefore easily moved. The shelves will hold about 60 blotter tests, with an equal number of duplicates. It rests upon a detachable base consisting of a stout iron frame 15 in. high, inclosed with a sheet-iron jacket.

Other Forms of Germinating Apparatus.—The so-called "Geneva tester," invented at the Experiment Station at Geneva, N. Y., consists of an oblong pan of galvanized iron or tin with ledges around the inside near the top upon which are suspended metal rods. Fig. 2298. Over these rods (*y*, *p*) is hung a strip of cloth, arranged in folds, with each end of the strip hanging down into the water, which covers the bottom of the pan. The lower edges of the folds are sewed (as at *o*) to hold them in place. The seeds are placed between these folds and are kept moist by capillary attraction; no provision is made for regulating the temperature, the pan being placed in an ordinary living room.

Porous saucers of unglazed clay set in shallow pans containing water are often used for fine seeds. Owing to the difficulty of procuring clay saucers of equal porosity plaster of Paris germinating dishes (Fig. 2299) are recommended. These can be made by any one at a trifling cost by means of a wooden mold, with a detachable top which consists of an ordinary pane of glass to which a Petri dish is attached with glue. Fig. 2300.

A very simple apparatus for sprouting seeds is shown in Fig. 2301. It consists of a shallow tin basin "re-dipped," which is given two coats of mineral paint both inside and out to prevent rusting. The bottom of the basin is covered with water, and a small flowerpot saucer is placed inside. The seeds are laid between two layers of moist blotting paper placed in the bottom of the saucer, and a pane of glass covers the dish, which is to be kept in a temperature of about 70° F., such as an ordinary living-room. The basin may be left partly open from time to time to permit exchange of air and gases. By using a good-sized dish with small saucers, and renewing the water occasionally, several kinds of seed may be tested at once at little expense. Extremes of temperature and excessive moisture must be avoided.





2298. Geneva seed-tester.

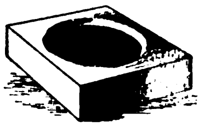
A still simpler germinating outfit than this and quite satisfactory for most cereals and vegetable seeds consists of two soup plates, one used as a cover, and two layers of cloth to hold the seeds. The cloths should be kept moist but not too wet. (See Fig. 23, Yearbook of the U. S. Department of Agriculture, 1895, p. 181.)

Temperature.—A temperature of 20° C. (68° F.) is generally maintained in germination tests. Seeds of celery, most grasses, and a few other species should be subjected to alternating temperatures of 20° C. and 30° C., the higher being used for six hours out of the twenty-four.

Duration of Germination Tests.—For purposes of comparison it is desirable to have uniform periods of time for conducting germination tests. The following periods have been adopted in this country and are practically the same as those used throughout Europe.

For laboratory tests: Ten full days for cereals, spurry, peas, beans, vetches, lentils, lupines, soja beans, sunflower, buckwheat, cruciferæ, Indian corn, and cow-peas; 14 full days for serradella, esparsette, beet fruits, rye grass, timothy, umbelliferæ, tobacco, lespedeza, and all grasses except poa, Bermuda grass, rye grass, and timothy; 28 full days for poa and Bermuda grass. Soil tests are to be continued two days longer in each case and the sprouts counted only at the close.

Special Treatment of Seeds Preparatory to Germination.—Soaking seeds in water for 6–15 hours before placing them in the germinating chamber, as frequently practiced, is to be condemned. As a rule, however, seeds of asparagus, lettuce, okra, and onion may be soaked to advantage. Asparagus should be placed in distilled water for 5 hours, then transferred to blotters which should be kept very wet for the first 48 hours; okra may be soaked in water at 50° C. for 5 hours. Owing to the readiness with which moulds develop upon onion seed, it should be soaked for an hour in a solution consisting of one part bichloride of mercury to 1,000 parts of water. Such seeds as okra, asparagus, adonis, canna, moonflower and lupine sprout better if previously clipped, care being taken not to injure the germ. The loud assertions often made of the value of treating seeds with certain chemicals to hasten germination, are, in the main, not worthy of notice.



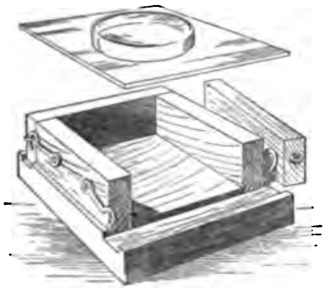
2299. Plaster of Paris germinating dish.

Testing Grass Seeds.—Most grass seeds require special treatment, both in purity and germination tests. For the latter neither blotters nor cloth can be depended upon as a seed-bed, hence soil tests are advisable. Care must be taken not to plant the seeds too deeply. Seed of red-top and June grass should be sown upon the surface and the lightest possible cover of soil or sand given it. Before planting the soil should be thoroughly watered, and after sowing a fine rose spray should be used to avoid disturbing the seeds. The same remarks will apply to soil tests of other fine seed.

To prevent counting empty glumes (chaff) a mirror-box (Fig. 2302) is useful. This consists of a box of hard wood, half an inch thick. It is 12 in. long, 8 in. wide and 6½ in. high, the front being open, and the top consisting of an ordinary pane of glass. The inside of the box is painted a dead black. Attached by hinges to the upper margin of the box in front is a rectangular piece of black binder's board, 12 x 8 in. in size. A smaller piece of similar board, 8 in. square, is attached to each end of the box at its upper edge. These boards are for the purpose of excluding all extraneous light. In the center of the box is a mirror about 10 x 7½ in. in size, so pivoted that it can be turned at different angles and reflect the light which enters the open side of the box up through the glass top.

Grass seeds are spread thinly over the surface of the glass top, and the mirror adjusted so as to throw the light up through the seed. The operator faces the apparatus with the open side opposite to him and toward the light. The mirror should be so arranged that it will not throw any light into the operator's face. With this apparatus the outlines of grass seeds within the glumes can be clearly seen, and the chaff can be removed with the other impurities of the sample.

A much simpler method of identifying the sound seeds in grasses consists in the use of a pane of glass, over the surface of which the seed, thoroughly wet, has been thinly spread. This glass is held up to the light, and with the forceps the good seed may be easily picked out. It would be well for the purchaser of grass seed, especially of meadow fox-tail, awnless brome and velvet grass, to make use of this simple test. For laboratory purposes the mirror box is to be greatly preferred, since the seed can be handled much better when dry.



2300. Mold for making plaster of Paris germinating dishes, and a Petri dish.

Testing Beet Seed. — Special methods are also required for testing red and sugar beet "balls," each of which contains from 1 to 7 seeds. Three separate lots of 100 balls each are selected with great care, so as to represent average samples. These are rubbed slightly between the hands, soaked 6–15 hours, then placed on blotting paper or sand at a constant temperature of 20° C., for 18 hours out of 24, the rest of the time at 30° C. In 3, 5, 8 and 11 days the balls are examined. Whenever 1, 2, or 3 seeds have sprouted in a single ball, they are carefully cut out with a knife, and the balance of the ball is removed to a second seed-bed, which is numbered to correspond with the number of the seeds which have germinated in the balls placed therein. At the next examination the sprouted seeds are again cut out and the clusters removed to another bed, numbered to agree with the total number of seeds per ball which have sprouted. The test is closed on the 14th day, when the sum of all the germinating seed of each lot of 100 clusters, together with the number of unsprouted seeds, is ascertained. The average of all the clusters is taken into account, especial care being exercised not to count as seeds any cavities which were empty at the beginning of the test.

Test for Genuineness or "Purity" of Stock. — The genuineness of the seeds of vegetables and other horticultural varieties of plants can only be told by means of a field test, which should be made in such cases whenever possible. The purity of stock of such seeds is of far more importance than a high percentage of purity and germination. In making field tests of different varieties of seed a check test should be conducted, using a sample, for purposes of comparison, which is known to be authentic. The different tests must be subjected to the same conditions of soil, etc. The genuineness of the seed of grass, clovers, and other forage plants can usually be ascertained by mere inspection and comparison with a standard collection.

Gilbert H. Hicks.

[The preceding article was prepared for this work by the late Gilbert H. Hicks, of Washington, D. C., in 1899, while in charge of pure seed investigations for the U. S. Department of Agriculture. It is printed practically as it was written. The subsequent changes in the Department methods are given below by Mr. Hicks' successor. L. H. B.]

The methods and apparatus in use in the Seed Laboratory of the U. S. Department of Agriculture have undergone some changes since the foregoing was written. These changes have been the necessary result of experience and are in substance the following:

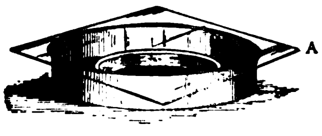
While purchasers are urged to buy the best seeds, it is doubtful whether, under the conditions of trade in the United States, arbitrary standards have much value. The comparison of the price and quality of different grades offered means more than an ideal standard which it is seldom practicable to enforce. A system of inspection that would certainly detect all weed seeds would make the seed too expensive for practical use.

The standard chamber is now covered with asbestos lagging instead of with felt; a single door covered with the lagging has been substituted for the double doors. An air bulb regulator, devised by Mr. E. Brown, has been substituted for the mercury bulb regulator.

The temperatures needed for the successful germination of seeds depend on the kind of seeds tested. Lettuce must have a low temperature, 15° C. giving best results. A temperature of 25–30° C. will almost entirely inhibit germination. Seeds of teosinte, on the other hand, demand 30° C., while vine seeds give best results under a temperature alternating between 20 and 30° C. A constant temperature at 20° C. is seldom used. Seeds naturally germinate under conditions of constantly changing temperature and favorable natural conditions should be reproduced as nearly as possible in the laboratory. Kentucky blue grass seed is not tested in the greenhouse, better results being obtained in the chamber by means of alternating temperature. When seeds, as of sugar beet, are sold on a guarantee, the re-test should be made under conditions similar to those under which the original test was made. The energy of germination, that is, the percentage of seeds that sprout in about one-fourth the full time, nearly represents what the seed will do in the field and is of greater importance than the full time test.

A. J. Pieters.

The Seed Trade of America.—*Early History.*—The history of the seed business in colonial times is largely one of importation from Holland and England, when small hucksters carried a few boxes of popular seeds with an assortment of dry goods, foodstuffs or hardware. Corn, barley, peas, onions, fruits and vegetables, necessaries in fact for direct use, first claimed the attention of the colonists. Towards the end of the eighteenth century we begin to find references to the saving of stock seeds, and in the newspapers of the day are a number of advertisements of shopkeepers who dealt in seeds. Agricultural seeds were an article of commerce as early as 1747 (Pieters), clover, onions, beans, peas, carrots, cabbage and cauliflower, etc., being raised for seed in the colonies at that time, though chiefly imported. At that time Boston did most of the business. Among the earliest advertisers of seeds for sale were Nathaniel Bird, 1763, a book dealer of Newport, R. I.; Gideon Welles, "on the Point," 1764; Samuel Deall, a dealer of general merchandise in New York in 1776; William Davidson of New York in 1768, while in Philadelphia, in 1772, we find one Pelatiah Webster advertising clover and duck grass seed; James Loughead "colly-flower" seed in 1775; while David Reid kept a general assortment in the same year.

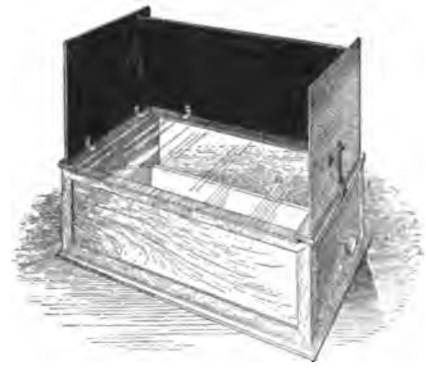


2301. Home-made germinating apparatus. A, complete; B, section.

Development of American Trade.—It was not until the opening of the nineteenth century that America began to find that seeds could be grown here as profitably as they could be imported. Grant Thorburn, in New York, and

David Landreth, of Philadelphia, seem to have been the largest dealers at that time. Thorburn's was perhaps the first business of importance devoted entirely to stock seeds, though this honor is disputed by the descendants of David Landreth. Thorburn, in his autobiography, says that he began his business by buying out the stock of one George Inglis for fifteen dollars, Inglis agreeing to give up the market and to devote himself to the raising of seeds for Thorburn. This is but one of many small beginnings from which has grown a trade which now amounts to many millions, and this relation between seedsmen and growers is largely typical of relations which have obtained in the trade ever since.

Railway and Postal Service.—With the development of the railway and the postal service the business grew by leaps and bounds, new land was found suitable for different varieties of seed, and a letter could carry to the countryman the garden seeds for his yearly consumption. There is probably no trade which has been more widely benefited by cheap postage and improved mail facilities, but of late years the abuse of their privileges by members of Congress has largely tended to negative this benefit. The originally beneficent distribution of free seeds to pioneers and needy settlers was a form of agricultural encouragement against which there could be no adverse criticism, but it has degenerated into an abuse, which is estimated to have taken a trade of some $4,000,000 during the past two or three decades out of the hands of the men who have built up the business.



2302. Mirror box for testing grass seeds.

Catalogues.—Grant Thorburn's catalogue of 1822 was the first to be issued in pamphlet form, and it was the pioneer of the many finely and carefully illustrated catalogues with which we are familiar to-day. These catalogues have been largely instrumental in facilitating the specialization of the industry and its subdivision in the hands of the country dealer, who buys seeds at wholesale, combining as they do the most complete lists and illustrations of varieties with directions as to methods, conditions, and seasons for planting. They are distributed literally in hundreds of thousands. It is of interest to remember that up to 1844 the wording on the bags was written by hand, a laborious and expensive process, which of itself is an indication of the small volume of the trade at that date.

Imports and Exports Statistics.—With regard to the export of seeds, A. J. Pieters' admirable report for 1899 in the Yearbook of the Department of Agriculture may be taken as the latest information. He says in part: "The statistics of exports date from 1855, and no separate records of imports of seeds were kept before 1873. Clover and grass seeds, especially timothy, have always taken the lead in the seed export trade, and until recent years garden seeds have not been a considerable factor in the total values. In 1825 some 10,000 bushels of clover seed were exported to England within a few months. How long this trade had existed we do not know. From 1855 to 1864 there is no record of any seeds exported except clover, but the value of exports increased from $13,570 in 1855 to $2,185,706 in 1863, the war apparently having no effect on the trade. The total value of the clover seed exported during this period aggregates $5,393,663. During the decade ending with 1880 clover seed was not separately entered except in the last year, but the total exports of seeds amounted during that period to $20,739,277. The aggregate was increased by more than $3,000,000 before the end of 1890. From 1891 to 1898 there has been a slight reduction in the average annual value of seed exports and also in the amount of clover and timothy seed sent abroad."

Development of Home Industry.—The importation of staple garden seeds had largely decreased by 1870, and with the exception of a few staples in agricultural and flower seeds, America may be said to have become to a great extent self-supplying. The greatest development of this industry has taken place since the close of the war. In 1878 J. J. H. Gregory estimated that there were in all 7,000 acres devoted to garden seeds, while the census of 1890 showed that there were 596 seed farms, containing 169,850 acres. Of these farms, 200 were established between 1880 and 1890, and it is likely that about 150 more were started during the same period. The census returns, however, do not give the actual acreage devoted to growing seeds. As many seeds are grown by those not regularly in the business, it is probable that census returns as to acreage are under rather than over the mark. The statistics available in the United States Census are very imperfect, partly owing to the lack of a continuous system in presentation, both in the returns of home industry and also in custom house returns, but chiefly to the reluctance of seedsmen and growers to make public the results of their business methods or even the methods themselves.

Contract System of Growing.—The contract system of supply has been the general method pursued by the larger seedsmen, farmers in those locations best suited to certain seeds contracting to grow supplies from stock seeds found by the seedsmen. As a rule, one farmer will grow only one or two varieties. A saving in the expense of supervisions has been made by the growth of the system of subletting a contract. The middleman being posted on the abilities of his neighbors and the qualities of their soils for many miles around, can often place and keep sight of the growing of many more varieties than he himself could handle on his own land. Many of these middlemen do not grow seeds themselves but act merely as the seedsman's growing agent among the farmers of a large district. Excepting in California, where the growers as a rule devote their whole capital to the business, it is a frequent custom throughout the country for seedsmen to make cash advances against crops. Few seed houses grow their own seeds.

Values of Staples, Home-grown and Imported.—The following table will give as close an estimate as can be made of the annual cost of the chief staple garden seeds handled in America:

Garden peas	$1,000,000	
Garden beans	300,000	
Onion seed	300,000	
Lettuce seed	250,000	
Cabbage seed	100,000	
Sweet corn	100,000	
Tomato seed	50,000	
Radish seed	30,000	
Turnip seed	25,000	
Beet seed	15,000	
Celery seed	5,000	
		$2,175,000
Miscellaneous seeds, Flower seeds		150,000
Probable invoice cost of imported garden seeds		1,700,000
Total growers' value		$4,025,000

An estimate recently made by one of the largest seedsmen in the country gives the capital invested in the business at about $12,000,000, and the actual acreage under seed at the present time as about 150,000 acres.

Staples and Localities of Production.—The following may be taken as the present principal garden seed staples and the localities where they are most profitably raised (See, also, Bailey, "Principles of Vegetable Gardening," p. 170):

String beans: New York, Michigan, Wisconsin.

Beets: Imported chiefly from France, owing to better method of selection in practice there, but would adapt itself to almost any of the older states of the Union.

Cabbage: About half imported, the other half chiefly Long Island, Connecticut, Pennsylvania, and to small extent, Puget Sound.
Cauliflower: Finest kinds imported from Denmark; coarser kinds from Italy.
Carrots: The bulk of finest kind imported from France, some finer grades in Connecticut, and coarser grades in California.
Sweet corn: Connecticut, Nebraska, New York, Ohio.
Cucumbers: Chiefly in Nebraska, northern New York.
Lettuce: California.
Watermelons: Nebraska, Kansas and the South.
Muskmelons: Nebraska.
Onions: Chiefly in California; Connecticut, New York, Michigan.
Peas: Northern New York, Canada, Michigan, Wisconsin.
Parsley: Imported from England and France.
Potatoes: Fine grades chiefly in Maine and New York; also in every state.
Spinach: Imported from Holland.
Squash: Nebraska.
Tomato: Chiefly in New Jersey, Pennsylvania, New York, Connecticut and Michigan.
Turnip: About half is imported from England and France, where it is grown chiefly from American seed; other half chiefly in Connecticut, New York and Pennsylvania.
Lima beans: California.
Celery: California.

Dealers in garden seeds are also large dealers in flowering bulbs, such as hyacinths, tulips, narcissus, crocus, etc. These are chiefly imported from Holland, south of France, Italy and Japan.

Divisions of the Trade.—The trade is divided into the main branches of garden and flower seeds and bulbs and agricultural seeds. The latter is practically a business by itself, devoted to such seeds as blue grass, timothy, clover, red top and alfalfa, some of which are exported or imported as the exigencies of the season's product demand.

Tariff.—Flower seeds are subjected to no import duties, while on garden seeds there is a tariff of 30 per cent ad valorem. It is a mooted point whether this tariff at the present time operates to the advantage of the trade, the principal seedsmen being generally of the opinion that it tends to stimulate over-production in this country.

Number of Firms in the Trade.—The main business of the country is in the hands of about 150 firms, but practically every groceryman in country towns and villages carries a stock during the spring season. These men, however, deal as a rule with the larger houses, and constitute the principal class of middlemen for retail trade.

Wholesale Seedsmen's League: Its Objects.—On August 24, 1900, some 42 of the leading houses of the country incorporated themselves in the Wholesale Seedsmen's League, with the object of regulating the general interests of the trade. The office of the League is in Philadelphia; its president, F. W. Bruggerhof, of New York; vice-president, S. F. Leonard, of Chicago; secretary and treasurer, Burnet Landreth, of Philadelphia. The climate and soils of the United States are so varied that entirely different methods of carrying on the seed business obtain in different trade centers, and one of the principal efforts of the League is in the direction of agreeing as to the uniform listing of prices for crops of the same seed which mature at different dates in different localities. It is hoped in this way not only to prevent the sacrifice of stock by growers in early districts, but also to prevent the demoralization of the general market, caused by the publication of clearance prices by seedsmen in an early district before the market has been adequately supplied by seedsmen in those districts in which the stock matures at a later season.

J. M. Thorburn & Co.

SEED-BOX. *Ludwigia alternifolia;* probably also sometimes applied to plants that have loose seeds in inflated pods, as *Crotolaria*.

SELAGINÉLLA (diminutive of Latin *Selago*, old name of a club moss). *Selaginellàceæ.* Club Moss. A large genus of mostly tropical plants of diverse habit, ranging from minute, prostrate annuals to erect or even climbing perennials. Easily recognized by the production of two kinds of spores—powdery microspores from which the male prothallus arises and larger microspores produced four in a sporange just within the axil of the terminal leaves of the stem, which often form a 4-angled spike. In all our cultivated species the lvs. are in four ranks, the two upper smaller and pressed against the stem, giving it a flattened appearance. Selaginellas are graceful fern-like greenhouse plants, often known to gardeners as Lycopodiums.

INDEX.

Africana, 33.
albo-nitens, 13.
amœna, 30.
apus, 12.
arborea, 5.
argentea, 30.
atroviridis, 14.
aurea, 2, 9.
Braunii, 31.
Brasiliensis, 11.
Brownii, 9.
cæsia, 5.
Californica, 15.
caulescens, 30.
cognata, 26.
concinna, 7.
cordata, 38.
cordifolia, 38.
crispa, 32.
Cunninghami, 10.
cuspidata, 21.
densum, 12.
denticulata, 2.
elongata, 37.
Emmeliana, 22.
erythropus, 35.
filicina, 36.
flabellata, 32.
geniculata, 37.
gracilis, 25.
grandis, 28.
hæmatodes, 36.
involvens, 19.
Kraussiana, 9.
lævigata, 5.
lepidophylla, 20.
Lobbii, 26.
Lyallii, 34.
Martensii, 16.
molliceps, 39.
patula, 4.
Pervillei, 33.
plumosa, 6.
Poulteri, 18.
rubella, 17.
rubricaulis, 39.
rupestris, 1.
sarmentosa, 4.
serpens, 3.
serrulata, 7.
setosa, 35.
stolonifera, 8.
uncinata, 5.
variegata, 9, 17.
Victoriæ, 24.
viticulosa, 29.
Vogelii, 33.
Wallichii, 23.
Willdenovii, 27.

A. *Lvs. all similar, many-ranked. Native species* .... 1. **rupestris**
AA. *Lvs. 4-ranked, of two sorts, forming an upper and a lower plane. Mostly hothouse exotics.*
B. *Foliage of the spikes uniform.*
C. *Main stem decumbent, usually rooting throughout.*
D. *Plants perennial: lvs. firm.*
E. *Stems continuous, i. e., without joints.*
F. *Branches one-eighth in. or less wide: stems 6–9 in. long* .... 2. **denticulata**
3. **serpens**
4. **patula**
FF. *Branches ¼ in. or more wide: stems 1–2 ft. long* 5. **uncinata**
6. **plumosa**
7. **concinna**
EE. *Stems articulated* .... 8. **stolonifera**
9. **Kraussiana**
DD. *Plants annual: lvs. and stem weak and flaccid*.....10. **Cunninghami**
11. **Brasiliensis**
12. **apus**
13. **albo-nitens**
CC. *Main stems ascending, branched nearly or quite to the base.*
D. *Roots confined to the lower half of the stems.*
E. *Plants perennial, with continuous stems.*
F. *Color of lvs. and stem pale or bright green*...14. **atroviridis**
15. **Californica**
16. **Martensii**
FF. *Color of lvs. dark green, becoming red: stem reddish brown*........17. **rubella**
EE. *Plants annual* ....18. **Poulteri**
DD. *Roots confined to the base of the stems.*
G. *Stems crowded in rosettes, curling closely when dry* ...19. **involvens**
20. **lepidophylla**
21. **cuspidata**

GG. *Stems 6–12 in. high, not curling in rosettes* ....22. **Emmeliana**

GGG. *Stems elongated (2 ft. or more), not crowded.*

H. *Lvs. equal-sided at base* ....23. **Wallichii**

24. **Victoriæ**

HH. *Lvs. produced on upper side at base.*25. **gracilis**

26. **Lobbii**

CCC. *Main stems climbing*.........27. **Willdenovii**

CCCC. *Main stems erect, the branches confined to the upper portion, naked below.*

D. *Stems not jointed.*

E. *Color of stems straw-colored, or at most only pink-tinted.*

F. *Lvs. long, the ultimate divisions of stem ½–⅔ in. wide*..............28. **grandis**

FF. *Lvs. shorter or minute; the ultimate divisions of stem one-sixth to one-twelfth in. wide.*

G. *Plants usually less than a foot high*....29. **viticulosa**

GG. *Plants 1–2 ft. high*...30. **caulescens**

31. **Braunii**

32. **flabellata**

33. **Vogelii**

34. **Lyallii**

EE. *Color of stems crimson* ...35. **erythropus**

36. **hæmatodes**

DD. *Stems jointed in lower two-thirds* ....37. **geniculata**

BB. *Foliage of spike of two kinds, the smaller forming a lower plane, the larger an upper* ....38. **cordifolia**

39. **mollíceps**

1. **rupéstris,** Spring. A small, rock-loving perennial, with branching stems 4–5 in. long, many-ranked lvs. ending in a white awn, and square, 4-angled spikes.—Native of the eastern half of the United States, but replaced by many allied species in the Rocky Mts. and on the Pacific coast. The writer has separated 6 of these and Dr. Hieronymus, at Berlin, has recently characterized 10 others.

2. **denticulàta,** Link. Fig. 2303. Stems less than 6 in. long, matted: lvs. of the lower plane slightly spaced. denticulate, cordate on the upper side at base and imbricated over the stem; lvs. of upper plane cuspidate. Mediterranean region throughout.—Trade names are vars. **aùrea** and **fòliis variegàtis.**

3. **sérpens,** Spring. Stems 6–9 in. long, trailing, bright green, copiously branched: lvs. of lower plane crowded, obtuse, spreading, ciliated at the rounded base; lvs. of upper plane obliquely oblong, acute. West Indies.—Long in cultivation.

4. **pátula,** Spring (*S. sarmentòsa*, A. Br.). Stems slender, trailing, pale green, 6–9 in. long, with long, tail-like tip, and fewer short pinnate branches: lvs. of lower plane crowded, erect-spreading, oblong-lanceolate, somewhat acute; lvs. of lower plane one-third as long, acute. Jamaica.

5. **uncinàta,** Spring (*Lycopòdium cæsium* and *Selaginélla cæsia*, Hort.). Stems 1–2 ft. long, extending in a somewhat naked tip beyond the branches, doubly grooved above, with short, alternate branches: lvs. thin, blue-green, with a distinct midrib, slightly more produced on the upper side; lvs. of upper plane cuspidate, much imbricated. China.—In 1893 John Saul offered "*S. cæsia arborea*" with the remark that *S. lævigata* was a synonym thereof.

6. **plumòsa,** Baker. Stems 6–12 in. long, flat above, often forked near the base: lvs. of lower plane close, bright green, much more produced on upper side of midrib, ciliated on both sides at base; lvs. of upper plane half as long, ovate, much imbricated. India, Ceylon, China, Malay Isles.

7. **concinna,** Spring (*S. serrulàta*, Spring). Stems 1 ft. or more long, copiously pinnately branched, with more or less fan-shaped compound branches: lvs. of lower plane crowded, bright green, glossy, much dilated and rigidly ciliate on the upper side at base; lvs. of upper plane one-third as long, long-cuspidate, much imbricated. Mascarene Islands.—Var. **fòliis variegàtis,** Hort., is cultivated.

8. **stolonifera,** Spring. Stems a foot or more long, with a more or less naked tip, angled above and below, with short, compound branches: lvs. of lower plane closely set, rigid, acute, short-ciliate and minutely auricled at base. West Indies.

9. **Kraussiàna,** A. Br. Stems 6–12 in. long, flat on the back, rounded on the face, copiously pinnate, with compound branches: lvs. of upper plane spaced on the branches and main stem, acute, slightly imbricated over the stem; lvs. of upper plane obliquely ovate, acute. Africa, Madeira.—*S. Bròwnii*, Hort., is a dwarf form from the Azores. Vars. **aùrea** and **variegàta** are American trade names.

10. **Cúnninghami,** Baker. Stems copiously pinnate, the lower branches compound: lvs. of lower plane ovate or oblong, cordate and very unequal-sided at base, much imbricated over the stem; lvs. of upper plane distinctly cuspidate. Brazil.

11. **Brasiliénsis,** A. Br. Stems copiously pinnate, the lower slightly compound: lvs. of lower plane mostly spaced, acute, cordate at base, ciliate and imbricated over the stem; lvs. of upper plane half as long, cuspidate. Brazil.—Similar to preceding, but with longer leaves.

12. **àpus,** Spring. Stems 1–4 in. long, angled above, with short, simple or forked branches: lvs. of upper plane pale green, serrulate but not ciliate, cordate on the upper side; lvs. of the upper plane ovate. Canada to Texas.—*Lycopodium densum*, cultivated at the Harvard Botanic Garden, is said to belong here.

13. **álbo-nitens,** Spring. Stems slender, trailing, the lower branches slightly compound: lvs. of lower plane spaced on main stem, short-ciliate, bright green; lvs. of upper plane one-third as long. cuspidate. West Indies.

2303. Club Moss used to cover the soil of an orchid pot—Selaginella denticulata (× ¼).

14. **atroviridis,** Spring. Stems 6–12 in. long, ascending, doubly grooved above: lvs. of lower plane spuriously 3-nerved, firm, broadly rounded; lvs. of the upper plane half as long, long-cuspidate, much imbricated. India.

15. **Califórnica,** Spring. Stems 4–6 in. long, 4-angled, copiously pinnate: lvs. of lower plane ovate, minutely

cuspidate, denticulate on the upper side at the base; lvs. of the upper plane very small, ovate-oblong. Said to come from Lower California, but not known at Kew and doubtfully in cultivation in this country.

2304. Poorly grown specimen of Club Moss, unsuitable for table decoration (× ¼).

For contrast with Fig. 2305. This species is *S. Martensii.*

16. **Mártensii**, Spring. Fig. 2304. Stems 6–12 in. long, flat or rounded below, angled above: lvs. of lower plane oblong-lanceolate, serrulate but not ciliate, slightly imbricated over the stem at base; lvs. of upper plane obliquely oblong, long-cuspidate. Mexico.—Exists under many varieties in cultivation.

17. **rubélla**, Moore. Stems 1 ft. long, somewhat erect in habit, reddish brown, with 2 grooves on the upper face: lvs. of lower plane dark green, becoming reddish with age, obtuse or obscurely cuspidate, ciliated and imbricated over the stem at the upper side of base; lvs. of upper plane ovate-cuspidate. Native country not known.—Has been in cultivation since 1870. Var. **variegàta**, Hort., is cultivated.

18. **Pòulteri**, Hort. Veitch. Stems densely tufted, slender, suberect, 2–3 in. long, three to four times dichotomously forked: lvs. of lower plane spaced, suborbicular, obtuse, bright green; lvs. of upper plane nearly as long, but ovate and acute. Azores.

19. **invólvens**, Spring. Stems densely tufted, 2–6 in. long, deltoid, branched nearly to the base: lvs. of lower plane crowded, ovate, with a distinct cusp, bright green, thick, rigid, serrulate on both margins; lvs. of upper plane nearly as long, ovate-lanceolate, cuspidate. Japan to India and the Philippines.

20. **lepidophýlla**, Spring. RESURRECTION PLANT. Stems 2–4 in. long, densely tufted, spreading in a close spiral so as to form a flattish expanse, curling closely into a ball when quite dry: lvs. of lower plane oblique, obtuse, minutely ciliated, green on the face, paler below; lvs. of upper plane nearly as long, obliquely ovate, obtuse. Texas and Mexico to Peru.—Often sold dry under the name of "Resurrection Plant" (which see), as the absorption of water will cause the ball with a dull brown exterior to expand and show its bright green upper face of the stems long after the plant is dead.

21. **cuspidàta**, Link. Stems densely tufted, 6 in. or more long, branched nearly to the base, with copiously compound branches: lvs. of lower plane obliquely ovate, cuspidate, dilated and ciliated on the upper side at the base, pale green edged with white; lvs. of upper plane nearly as long, obliquely ovate, cuspidate. A plant occurring under the horticultural name *Lycopodium cordifolium* has the stem a foot or more long and simple in its lower part, and doubtless represents a distinct species. Cuba and Mexico to Venezuela.

22. **Emmeliàna**, Hort. Fig. 2305. Stems 6–12 in. high, the primary branches ascending, bipinnate: lvs. of lower plane close, obliquely ovate, those of the branchlets narrower and minutely spinulose; lvs. of upper plane raised above those of the lower, one-half as large, spinulose-serrulate, short-cuspidate. S. Amer.? Named for Th. Emmel, a German gardener.

23. **Wállichii**, Spring. Stems 2–3 ft. long, with lanceolate branches and simple crowded branchlets: lvs. of lower plane crowded, smaller towards the end of the pinnules; lvs. of upper plane one-fourth as long, cuspidate: spikes ½–1 in. long. India and the East Indies.—Highly ornamental.

24. **Victòriæ**, Moore. Stems 3–4 ft. long, with lanceolate-deltoid, caudate branches, with the lower branchlets forked or slightly pinnate: lvs. of lower plane crowded, a line long, truncate at base and obscurely petioled; lvs. of lower plane one-fourth as long, short-cuspidate: spikes 1–2 in. long. Borneo and Fiji Islands.

25. **grácilis**, Moore. Stems 2–3 ft. long, somewhat roughened, with lanceolate branches and simple branchlets: lvs. of lower plane ovate-falcate, adnate to stem on lower side at base; lvs. of upper plane ovate-lanceolate, cuspidate. Polynesia.

26. **Lóbbii**, Moore (*S. cognàta*, Hort.). Stems 3–4 ft. long, with lanceolate-deltoid branches and contiguous simple or forked branchlets: lvs. of lower plane oblong-lanceolate, acute, bright green, truncate at base; lvs. of upper plane one-third as long, obliquely ovate, cuspidate. Borneo and Sumatra.

27. **Willdenovii**, Baker. Stems reaching a length of many feet, with spreading deltoid branches and much compound branchlets, the ultimate short and contiguous: lvs. of lower plane crowded, ovate or oblong, tinted with blue, obscurely petioled; lvs. of upper plane one-third as long, obliquely oblong, not cuspidate. India and the East Indies.

28. **grándis**, Moore. Stems 1½–2 ft. long, branched above: lvs. of lower plane crowded, lanceolate, acute, rather firm; lvs. of upper plane one-third as long, ascending, much imbricated. Borneo.

29. **viticulòsa**, Klotzsch. Stems with deltoid 2–3-pinnate branches: lvs. of lower plane ascending, acute, short-ciliated and much imbricated over the stem; lvs. of upper plane one-third as long, obliquely ovate, cuspidate. Central America.

30. **cauléscens**, Spring (*S. amæ̀na*, Hort.). Stems stiff, erect, the short final branchlets curling when dry: lvs. of lower plane crowded, ovate, falcate, bright green; lvs. of upper plane one-third to one-fourth as long, cuspidate. Japan, China and East Indies.—Var. **argéntea**, Hort., is advertised.

2305. Well-grown specimen of Selaginella Emmeliana (× ¼). Suitable for table decoration.

31. **Braùnii**, Baker. Stems deltoid and flexuous above, with deltoid erect-spreading pinnæ, the pinnules short, deltoid and spaced: lvs. of lower plane ovate-rhomboid, usually revolute at both edges; lvs. of lower plane short-cuspidate. West China.

32. **flabellàta,** Spring. Stems erect, deltoid, decompound, with contiguous final branchlets: lvs. of lower plane obliquely ovate, acute, broadly rounded and ciliated at the base; lvs. of upper plane obliquely ovate, cuspidate. Widely distributed in tropical regions.—One of the forms of this is cultivated as *S. críspa*, Hort.

33. **Vògelii,** Spring (*S. Africàna*, A. Br. *S. Pervíllei*, Spring). Stems decompound above, the lower pinnæ deltoid, petioled, 3–4-pinnate: lvs. of lower plane lanceolate, ascending, often revolute on both edges, truncate at base; lvs. of upper plane minute, strongly cuspidate. Africa.

34. **Lýallii,** Spring. Stems deltoid above, the lower pinnæ bipinnate, the final divisions ½–1 in. long, ⅛–⅙ in. wide: lvs. of lower plane oblong-lanceolate, falcate, acute; lvs. of upper plane minute, acute. Madagascar.

35. **erýthropus,** Spring. Stems under a foot long, deltoid and decompound above, the lower pinnæ 3-pinnate, the ultimate divisions one-twelfth to one-eighth in. wide: lvs. of lower plane oblong-lanceolate, acute, strongly ciliated; lvs. of upper plane one-half as long, cuspidate. Tropical America.—*S. setòsa*, Hort., is said to be a starved form of this species.

36. **hæmatòdes,** Spring (*H. filicìna*, Spring). Stems 1–2 ft. long, the deltoid pinnæ 3–4-pinnate, the ultimate divisions ⅛–⅙ in. wide: lvs. of lower plane ascending, oblong-rhomboid, acute, dilated on upper side at base, not ciliated; lvs. of upper plane minute, cuspidate. Venezuela to Peru.

37. **geniculàta,** Spring (*S. elongàta*, Kl.). Stems 2–3 ft. long, decompound, with lower pinnæ 3-pinnate, the divisions ascending and pinnately arranged: lvs. of lower plane ovate, acute; lvs. of upper plane one-third as long, ovate-lanceolate. Costa Rica to Peru.

38. **cordifòlia,** Spring (*S. cordàta*, Kl.). Stems trailing, a foot long, with short branches often ending in whip-like tips: lvs. of lower plane acute, pale green, membranous, ciliated on the upper edge, dilated and subcordate; lvs. of upper plane ovate-lanceolate, cuspidate. West Indies.

39. **mólliceps,** Spring (*S. rubricaùlis*, A. Br.). Stems erect, 6–9 in. long, bisulcate above, much compound: lvs. of lower plane oblong-lanceolate, dark green, very unequal-sided, serrulate on the upper edge; lvs. of upper plane one-half to one-third as long, ovate or ovate-lanceolate, cuspidate. Africa.

The following American trade names cannot be satisfactorily accounted for as species: *S. acaùlis* is said to be one of the most important commercial species cult. in America.—*S. circinàtum* is cult. at Harvard Botanic Garden.—*S. Lageriàna* was introduced from Colombia and probably belongs to species already described from that country. It is said to be a very light green plant and a strong grower, whereas S. Pitcheriana is of dwarfer habit and with stems and under surface of fronds red and upper surface dark green.—*S. paradóxa*. Offered by John Saul, 1893.—*S. Pitcheriàna*. Consult S. Lageriana. Colombia.—*S. rubicúnda* and *triangulàris* were offered by Saul in 1893.—*S. umbròsa*. Once cult. by Pitcher & Manda, of the United States Nurseries.

L. M. UNDERWOOD.

Selaginellas are favorite plants in every good conservatory, being greatly admired for their feathery, moss-like foliage. They have various shades of green, and some of them are remarkable for metallic and iridescent tints, especially bronze and bluish colors, the latter being very unusual among plants in general. *S. Willdenovii* is a very choice large-growing species of the bronze and blue class. Another is *S. uncinata*, often called "Rainbow Moss." Selaginellas are often grown for their own sake as specimen plants, but they are also very commonly used as edging for greenhouse beds, for covering unsightly spots under the benches, and for hiding the surface soil of large tubs, orchid pots and the like. See Fig. 2303. They are also delightful subjects for table decoration when grown in pans or jardinières. For this purpose a well-grown Selaginella should be a dense, compact mass of fluffy and feathery green, not a weak, thin, straggling plant, as shown in Figs. 2304 and 2305. Selaginellas are also employed in bouquets of flowers, fronds being used for "green" instead of asparagus or fern. Occasionally a fancier of the more difficult species grows a large specimen in a wardian case for exhibition.

In general, Selaginellas are of easy culture. As a rule they prefer shade and moisture and are somewhat tender in foliage compared with some of the commonest of commercial ferns. *S. denticulata*, *Kraussiana*, *Martensii*, and some other commercial favorites may be rapidly propagated without any preliminary treatment in the cutting bench. Cuttings of these species about an inch and a half long may be inserted directly into small pots of light sandy soil, placed in a shady position. Syringe them lightly three or four times a day for a week, at the end of which time they will take root. They will soon grow into salable plants.

The popular *S. Emmeliana*, which is generally considered by florists a variety of *S. cuspidata*, requires different treatment. It is much slower and sometimes requires about nine months from the making of cuttings until the young plants are ready for potting.

Fill regular fern boxes with fern soil, adding one part in five of sand, and press firmly. Select mature fronds of the *S. Emmeliana*, cut them into pieces half an inch long, scatter thinly over surface of soil, and put just enough finely screened soil on top of the cuttings to attach some small portion of them to the soil. Water thoroughly, cover with glass, and place in a temperature of 70° F. In this condition they will soon form roots and little plants at almost every joint. When sufficiently large they should be separated and transplanted singly an inch apart into boxes, where they may be left until large enough to be potted.

The following list of Selaginellas for special and general purpose is not designed to be complete, but merely suggestive. For commercial purposes, *S. denticulata*, *Kraussiana*, *Martensii* and *Emmeliana;* for carpeting the soil, *S. denticulata;* for table decoration, *S. Emmeliana* and *S. Martensii;* for cutting, the commercial kinds; for veranda boxes, *S. Braunii;* for bronze and blue colors, *S. Willdenovii* and *S. uncinata;* for specimen plants and exhibitions, *S. Braunii*, *Lyalli*, *viticulosa*, *Wallichii*, and *Willdenovii*. Also the following, which are generally considered more difficult subjects; *S. atroviridis*, *hæmatodes* and *rubricaulis;* for curiosity, *S. serpens* and *lepidophylla*.

The curiosities of the genus call for special mention. *S. serpens* is remarkable for its changes of color during the day. In the morning the foliage is bright green; during the day it gradually becomes paler as though bleached by the light; toward night it resumes its lively green hue again. For *S. lepidophylla*, see *Resurrection Plant*.

The following species also deserve a few running notes: *S. Braunii* is an old favorite which is often incorrectly labelled *S. Willdenovii* in collections. Its branches, or "foliage" in the popular sense, are exceptionally tough and wiry for the genus. Variegated forms appear in *S. Martensii*, *Kraussiana* and *involvens*, the last-named species being prolific in singular forms. *S. viticulosa* is better adapted for use as a pot-plant than for mingling in a fernery, because of its strong-growing, erect, fern-like habit. The branchlets are thrown up from creeping stems and do not root readily, so that this species is usually prop. by division or spores.

W. H. TAPLIN, N. N. BRUCKNER and W. M.

SELECTION. See *Plant-Breeding* and the discussion under *Seedage*.

SELÈNIA aùrea, Nutt., is a hardy annual of the mustard family, a native of the U. S. from Arkansas and Texas to the base of the Rockies. It is not known to be cult. in America, but it seems to be one of the prettiest of our few native ornamental crucifers. It has small yellow fls. about ½ in. across, each of the 4 petals having a central band of red. It is also interesting for its finely cut foliage and its flat pods through which the seeds may be vaguely seen, as in the case of Lunaria, or "Honesty." It grows about 9 in. high. B.M. 6607.

W. M.

SELENIPÈDIUM (from *selene*, moon, and *pedion*, ground; analogous to Cypripedium. It was evidently intended to derive the second part of the word from *pedilon*, sandal, and some botanists and horticultural writers use the word thus derived, but Reichenbach wrote Selenipedium). *Orchidàceæ.* The genus Selenipedium comprises the South American Cypripediums. Technically it is separated from the genus Cypripedium on account of the three-loculed ovary. Aside from this character the flowers resemble those of Cypripedium, but the inflorescence is quite distinct. The scapes of Cypripedium bear a single flower (rarely 2 or more), while those of Selenipedium bear several flowers and often become paniculately branched. In general habit the Selenipediums are more robust and luxuriant. The lvs. are crowded in dense tufts on short, creeping rhizomes. As in many orchid genera, the species of Selenipedium are remarkable for the number of color variations of their flowers. There are many varieties that form connecting links between species, thus making the genus a very difficult one for satisfactory description. It is hoped that the following account, however, will serve to distinguish the leading types.

This genus, like the true Cypripediums, has been a favorite one with hybridizers. Some of the best known species, as *S. Sedeni* and others, are the products of crosses. The total number of hybrids far exceeds the number of original species. A part of the genera Cypripedium and Selenipedium has been separated by some botanists as a distinct genus, Paphiopedilum, which is now sometimes found in horticultural writings.

For culture, see *Cypripedium.*

HEINRICH HASSELBRING.

All Selenipediums enjoy plenty of heat and moisture in the growing season, March to November (65–90°). Give good drainage. Use chopped sphagnum with broken clinkers from the furnace, and the addition of a little leaf-mold, raising the material as high above the rim of the pot as possible. This material is especially to be recommended for the young and divided plants. Give slight shade, and grow on raised benches near the glass. Water sparingly until growth begins. The four species, *S. Dominianum*, *S. Sedeni*, *S. Schlimii* and *S. Sargentianum*, should not be overpotted. Fill pots three-fourths full of drainage, then place a thin layer of coarse fern root, which will fill pot to level of the rim. Place the plant on top and then fill 2½ to 3 in. on top with chopped sphagnum and leaf-mold mixed with coarse sand or pulverized coal clinkers. Keep the moss in a growing condition.

WM. MATHEWS.

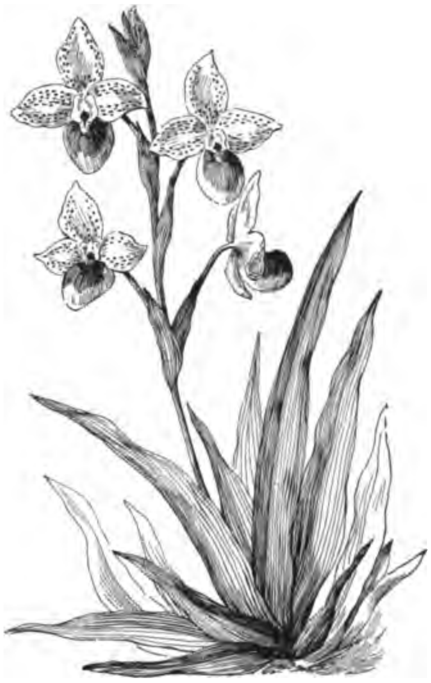
INDEX.

(Including some names advertised under Cypripedium.)

Ainsworthii, 6.
albiflorum, 1.
albo-purpureum, 11.
atratum, 15.
Boissierianum, 17.
calurum, 12.
candidulum, 2.
cardinale, 5.
caricinum, 19.
caudatum, 14.
Dominianum, 16.
giganteum, 1.
grande, 15.
Hartwegii, 10.
Klotzschianum, 18.
Lindeni, 14.
Lindleyanum, 9.
longifolium, 10.
Luxemburgense, 14.
magniflorum, 10.
nigrescens, 14.
Pearcei, 19.
porphyreum, 4.
reticulatum, 17.
Rœzlii, 10.
roseum, 10, 14.
Rougierii, 12.
Sargentianum, 8.
Schlimii, 1.
Schomburgkianum, 18.
Schrœderæ, 13.
Sedeni, 2.
Seegerii, 14.
vittatum, 7.
Wallisii, 14.
Warscewiczianum, 14.
Warscewiczii, 14.
Weidlichianum, 3.

A. *Petals ovate to lanceolate, plane or scarcely twisted.*
  B. *Fls. white or pink*......... 1. **Schlimii**
  BB. *Fls. purple and white*...... 2. **Sedeni**
    3. **Weidlichianum**
    4. **porphyreum**
    5. **cardinale**
    6. **Ainsworthii**
AA. *Petals linear-oblong* .... 7. **vittatum**
    8. **Sargentianum**
    9. **Lindleyanum**
AAA. *Petals lanceolate-caudate* ....10. **longifolium**
    11. **albo-purpureum**
    12. **calurum**
    13. **Schrœderæ**
AAAA. *Petals linear-caudate*
  B. *Lvs. broadly linear*........14. **caudatum**
    15. **grande**
    16. **Dominianum**
    17. **Boissierianum**
  BB. *Lvs. narrowly linear* ......18. **Klotzschianum**
    19. **caricinum**

1. **Schlìmii**, Linden (*Cypripèdium Schlìmii*, Linden). Fig. 2306. Lvs. 4–6, ligulate, leathery, sharp-pointed, 9–12 in. high: scape longer than the lvs., hirsute, often branched, 2–8-fld.: sepals less than 1 in. long, ovate-obtuse, the lower a little larger than the upper and concave, white or spotted with crimson on the inner side; petals like the sepals; labellum an elliptic bag with a contracted opening, white with a large crimson blotch in front; staminodium yellow. Late summer. Colombia. B.M. 5614. F.S. 18:1917.—Var. **albiflòrum**, Linden. Fls. white, except the yellow staminodium and a suffused blotch on the labellum. I.H. 21:183. Vars. **gigantèum** and **supérbum** are also advertised.



2306. Selenipedium Schlimii (× ⅛).

2. **Sèdeni**, Hort. Fig. 2307. Lvs. numerous, crowded, 12–18 in. long, tapering to a point: scapes 12–18 in. high, about 4-fld. but often sending out secondary flowering branches from the axils of the bracts after the first fls. have fallen: fls. 3½–4 in. across the petals; lower sepal oval, greenish white, upper sepal oblong, acute, with faint purplish green veins; petals lanceolate, twisted, purple shading to greenish white at the base; labellum rich crimson-purple shading to paler purple behind, spotted inside.—Garden hybrid between *S. longifolium* and *S. Schlimii.* A very luxuriant free-flowering plant. F.M. 1876:206; 1878:302. R.H. 1879:470. Var. **candídulum**, Reichb. f. Sepals white; petals white tinged with rose; labellum darker rose. A hybrid between *S. longifolium* and *S. Schlimii*, var. *albiflorum.* The following names are also in the trade: **grandiflòrum, sanguíneum, supérbum.**

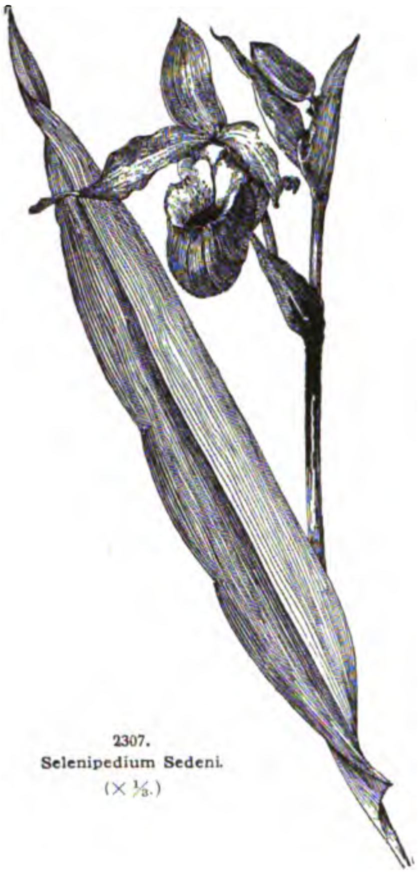
3. **Weidlichiànum**, Hort. A garden hybrid between *S. Hartwegii* and *S. Schlimii.* It hardly differs from *S. Sedeni.* G.M. 34:274 (as *Cypripedium Weidlinianum*).

4. **porphýreum**, Reichb. f. (*Cypripèdium porphýreum*, Reichb. f.). Lvs. broadly strap-shaped, acute, about 1 ft. long: fls. mostly purple, resembling those of *S. Sedeni*, but without protuberances on the open sides of the lip. The sepals and petals are oblong and more acuminate. Garden hybrid between *S. Rœzlii* and *S. Schlimii.*

5. **cardinàle**, Reichb. f. (*Cypripèdium cardinàle*, Reichb. f.). Lvs. long, straight: dorsal sepal blush-

white, slightly streaked with green; petals broad, ovate-oblong, undulate, white tinged with rose-purple near the base; labellum intense purple; staminodium white. Garden hybrid between *S. Sedeni* and *S. Schlimii*. Gn. 27:495.

6. **Àinsworthii**, Reichb. f. (*Cypripèdium Àinsworthii*, Reichb. f.). Lvs. ligulate, acuminate, 1½ ft. long: scape shorter, pubescent, few-fld.: upper sepal oblong, acutish, undulate, whitish or yellowish green with a pale purple border; lower sepal very broad and concave with a reflexed margin, shorter than the lip; petal broad, purple, with a green midvein and a pale area near the base; side lobes of the lip yellow, with numerous spots. A garden hybrid between *S. Sedeni* and *S. Rœzlii*.



2307. Selenipedium Sedeni. (× ⅓.)

7. **vittàtum**, Reichb. f. (*Cypripèdium vittàtum*, Vell.). Lvs. 1 ft. long, linear-ligulate, acute, margined with yellow: stems few-fld., 12–18 in. high; dorsal sepal oblong, subacute, greenish striped with red; lower sepal about twice as broad as the upper, green; petals linear, pendent, undulate, reddish brown, striped with green and green toward the base, longer than the sepal; labellum shorter than the sepals, brown, greenish spotted with reddish brown inside. Brazil. I.H. 23:238.

8. **Sargentiànum**, Rolfe. Fig. 2308. Lvs. tufted, 6–8 in. long, oblong-lanceolate, acuminate, with golden margins: scape 6 in. high, 2–3-fld.: dorsal sepal oblong, acute, pale yellow with red veins; lower sepal ovate, subacute, shorter than the lip; petals longer than the sepals, strap-shaped, slightly twisted, undulate, ciliate, pale yellow streaked with red and with bright red margins; labellum yellow, with pale red veins, deflexed side lobes speckled with red. Brazil. B.M. 7446. G.C. III. 15:781. A.G. 21:423.

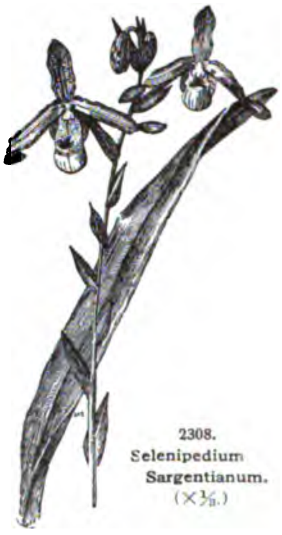
9. **Lindleyànum**, Reichb. f. & Warsc. (*Cypripèdium Lindleyànum*, Schomb.). Lvs. 15–20 in. long, leathery, deep green, with yellow margins: scape many-fld., pubescent, 2–4 ft. high: upper sepal ovate-oblong, undulate, light green with brownish veins; petals 2 in. long, deflexed, green with brown veins, ciliate; labellum olive-green, with brown veins and much spotted on the side lobes. Guiana.

10. **longifòlium**, Reichb. f. (*S. Rœ́zlii*, Reichb. f. *S. Hártwegii*, Reichb. f. *Cypripèdium longifòlium*, Warsc. and Reichb. f. *C. Rœzlii*, Regel. *C. Hártwegii*, Reichb. f.). Lvs. tufted, 8–12 in. long, narrowly strap-shaped, tapering to a point and strongly keeled: scape 2 ft. high, purplish, sparingly pubescent: fls. large; upper sepals ovate-lanceolate, pale yellowish green, faintly streaked with purple; lower sepals ovate-obtuse, shorter than the lip; petals 3½ in. long, spreading, narrowly lanceolate, twisted, pale yellow with rose-colored margins and with a white line on the edge; labellum 2 in. long, green shaded with dull purple or brown in front, side lobes yellow, spotted with pale purple. Costa Rica. B.M. 5970 and 6217. I.H. 20:138. R.H. 1873, p. 416; 1893, pp. 18, 19. F.M. 1874:119. F. 1871:126.—*S. Rœzlii*, sometimes considered as a distinct species, is of more robust habit, having lvs. 2 ft. long and green scapes. Var. **magniflòrum**, Hort. (*Cypripèdium magniflòrum*, Hort.), has the petals margined with white. A.F. 7:707. The following varieties also are distinguished in cultivation: **grandiflòrum**, **latifòlium**, and **ròseum**.

11. **álbo-purpùreum**, Reichb. f. (*Cypripèdium álbo-purpùreum*, Reichb. f.). Lvs. long, strap-shaped and recurved: fls. larger than those of *S. Sedeni;* sepals oblong-acute, subequal, whitish, with a purplish tinge on the margins; petals 5–6 in. long, linear, hanging downward and twisted, purplish; labellum purplish on the borders, the inflexed lateral lobes nearly closing the mouth, white, with dark purple spots. Garden hybrid between *S. Schlimii* and *Dominianum*. Gn. 21, p. 332. —A var. **supérbum** has been advertised.

12. **calùrum**, Nichols. (*Cypripèdium calùrum*, Reichb. f.). Lvs. numerous, tufted, long acute, channeled: scape much taller than the lvs., brownish red, branching: fls. large, about 5 in. across the petals; dorsal sepals oblong-ovate, pale green, with longitudinal purplish ribs, flushed with red on the outside; lower sepal broadly ovate and much smaller; petals lanceolate, undulate, pale green in the center and at the base, margins rose-red; labellum oblong, rose-red tinted with brown in front; side lobes deeply inflexed, cream white, with irregular spots of purple. Garden hybrid between *S. longifolium* and *S. Sedeni*. F. 1884:145.—There are several horticultural forms, one known as **Rougièrii**.

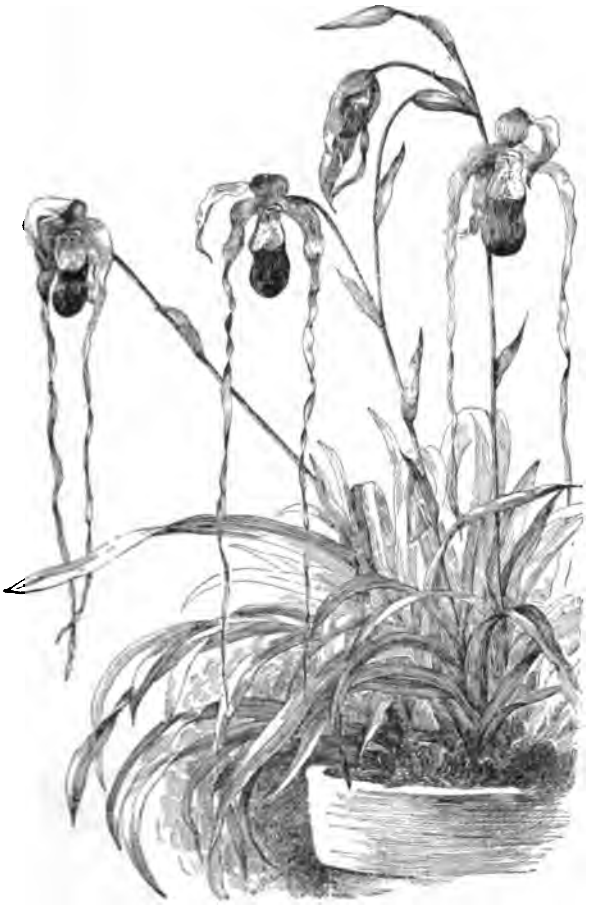
13. **Schrœderæ**, Hort. (*Cypripèdium Schrœderæ*, Hort. Veitch, ex-Reichb. f.). Plant of the habit of *S. Sedeni*, with fls. resembling those of *S. albo-purpureum* but larger: upper sepals nearly ochre-colored, with purple veins; lower sepals very broad, ochre-colored, with purple veins; petals long-lanceolate, undulate, pendent, 4 in. long, greenish white in the middle, crimson-purple around the margin; labellum purple outside, inflexed lobes yellow, with brown blotches. Garden hybrid between *S. caudatum* and *S. Sedeni*.



2308. Selenipedium Sargentianum. (×⅕.)

14. **caudàtum**, Reichb. f. (*Cypripèdium caudàtum*, Lindl. *Cypripèdium Lindeni*, Van Houtte. *Cypripedium Warscewicziànum*, Reichb. f.). Lvs. strap-shaped,

rather stiff upright, about 1 ft. long: scape 12–24 in. high, about 4-fld.: dorsal sepals 5–6 in. long, lanceolate, pale yellow, verging on creamy white and veined with greenish, lower sepal similar; petals pendent, twisted, often attaining a length of nearly a yard, yellowish, shaded with brown on the outside and becoming brownish crimson toward the tips. Peru. F.S. 6:566. R.H. 1857, p. 318; 1883, p. 351; 1885, p. 472. G.C. II. 3:211; 26:269. Gn. 3, p. 313; 26, p. 72; 32, p. 301; 46, p. 85. A.F. 3:132; 6:859. Gng. 5:265. G.M. 31:557; 33:795; 35:489.



2309. Selenipedium Dominianum (× 1-5).

—One of the largest of the Selenipediums and remarkable on account of the extremely long petals. Peloric forms with the third sepal (labellum) resembling the other two have passed under the name of *Uropedium Lindeni*, Lindl.

Var. **ròseum**, Hort. (*S. caudàtum*, var. *Warscewiczii*, Godfroy.). Sepals yellow, with orange veins; petals deep purple; labellum deep yellow in front, green behind. I.H. 33:596. Var. **Wállisii**, Hort. (*S. Wállisii*, Reichb. f. *Cypripèdium Wállisii*, Hort.). Lvs. paler green: fls. pale, and in every way more delicate than the type. Gn. 49, p. 140. Numerous other varieties of this species are distinguished in cultivation. The following names occur in trade lists: **àureum, Luxemburgénse, rùbrum, supérbum, Seègerii, spléndens, nigréscens.**

15. **gránde**, Reichb. f. (*Cypripèdium gránde*, Reichb. f.). A garden hybrid between *S. Ræzlii* and *S. caudatum*, resembling the former in habit and flowers but much more vigorous, with darker fls.: lvs. dark green, over 2 ft. long: scape over 3 ft. high, with several large, shining fls.; sepals long, oblong-lanceolate, yellowish white, veined with green; petals long, pendent, yellowish green above, becoming rose-pink; labellum large, greenish yellow in front, whitish behind; side-lobes white, spotted with crimson. G.M. 32:87. A.F. 11:1349. —Var. **atràtum.** A hybrid between *S. longifolium*, *Ræzlii* and *S. caudatum roseum*. G.C. III. 15:692.

16. **Dominiànum**, Hort. (*Cypripèdium Dominiánum*, Reichb. f.). Fig. 2309. Lvs. numerous, about 1 ft. long, acuminate: fls. yellowish green, with copper-brown shades and markings; labellum deep reddish brown, reticulated in front and yellowish green behind. A hybrid between *S. Pearcei* and *S. caudatum*. It is intermediate between the parents, but differs from *S. caudatum* by its acute bracts and narrower lvs., from *S. Pearcei* by the transverse staminode and hairy ovary. Gn. 3, p. 491. F. 1874, p. 57.—The following varieties are also distinguished in cultivation: **élegans, rubéscens, supérbum.**

17. **Boissieriànum**, Reichb. f. (*Cypripèdium reticulàtum*, Reichb. f.). Plant of vigorous habit: lvs. about 3 ft. long, acuminate: scape few-fld. or sometimes paniculate, 3–7-fld.: fls. of peculiar light green tints, with a few sepia brown and green blotches on the whitish inflexed part of the lip and with some brown spots on the margins of the sepals: ovary dark brown, with green apex and ribs; upper sepals ligulate-lanceolate, very crisp; lower sepals oblong, about equal to the labellum, crisp; petals spreading, long-linear, twisted and very crisp on the margins. Peru. G.C. III. 1:143; 21:54, 55. G.F. 4:605.

18. **Klotzschiànum**, Reichb. f. (*Cypripèdium Schomburgkiánum*, Klotzsch and Reichb. f.). Lvs. linear, 6–12 in. long, scarcely ⅛ in. wide, rigid, keeled: scape longer than the lvs., hirsute, purple, 2–3-fld.; dorsal sepal ovate-lanceolate, pale rose-colored, with reddish brown veins, the lower ovate, boat-shaped, colored like the upper one; petals 3½ in. long, linear, twisted, colored like the sepal; labellum greenish yellow, the inflexed side-lobes whitish, spotted. British Guiana. B.M. 7178. G.C. III. 15:625.

19. **caricìnum**, Reichb. f. (*Cypripèdium Pèarcei*, Hort. *Cypripèdium caricìnum*, Lindl. & Paxt.) Lvs. 1 ft. long, springing in sedge-like tufts from the long creeping rhizome: scape longer than the lvs., 3–6-fld.: fls. mostly pale greenish, with the segments bordered with white and having purple tips; sepals broadly ovate, waved, as long as the lip; petals more than twice as long, pendent, narrow and much twisted; labellum oblong, the upper margins flat; staminodium provided with 2 hairy processes. Peru. B.M. 5466. F.S. 16:1648.

HEINRICH HASSELBRING.

SELF-HEAL. See *Brunella*.

SELF-STERILITY OF FRUITS. Self-sterility may be roughly defined as the inability of a given plant to produce fertile seeds when pollinated with its own pollen. With the rapid strides in plant-breeding, propagation and cultivation, self-sterility and sterility have become important subjects in determining the value and adaptability of new varieties to the various needs and purposes of the planter.

The study of self-sterility in more recent years has been confined mostly to fruit trees and small fruits, and has been conducted by a number of experiment station workers. The list of self-sterile and unisexual varieties is now fairly large for apples, pears, plums, grapes and strawberries. In the case of peaches, apricots, cherries, nectarines and prunes little has been done to determine the number of self-sterile and partially self-sterile varieties. The causes which tend to produce self-sterility in cultivated plants may be briefly summarized as follows:

(1) Change of environment due to domestication produces change in the reproductive organs of the plants. It may result (*a*) in the suppression in whole or in part of either stamens or pistils; (*b*) in the infertility or impotency of the pollen upon its own pistils; (*c*) in changing the time of ripening of the pollen and of the receptivity of the stigma.

(2) Asexual propagation tends to reduce the importance of seed production, and to transmit and fur-

ther develop any tendency towards self-sterility and separation of the sexes which the parent plant may possess.

(3) The careless practice of taking cions promiscuously from the nursery row and from unreliable sources may perpetuate self-sterile individuals.

(4) Breeding and selecting for other qualities than those associated with seed production may tend to favor these qualities at the expense of the latter.

(5) Crossing and intercrossing of hybrids may tend to modify the reproductive organs and to produce self-sterility.

(6) Excessive cultivation and over-feeding with nitrogenous fertilizers may induce too vigorous wood-growth at the expense of seed and fruit production.

Self-sterile varieties are unable to fruit and produce seed when planted by themselves. When such varieties are desired for planting they should always be planted with other varieties whose time of flowering is the same. Self-sterility is not always complete. There are all intermediate grades between plants that are wholly self-sterile and those that are self-fertile.

For a condensed list of the important varieties of leading fruits which are known to be self-sterile or self-fertile, see Bailey's "Principles of Fruit-Growing," 3d edition, pp. 229, 230, and "The Pollination of Pear Flowers," by M. B. Waite, Bulletin 6, Div. of Veg. Path., U. S. Dept. Agric. A full and popular treatment of the whole problem as it affects fruit-growers will be found in Bulletin 181, Cornell Exp. Sta., by S. W. Fletcher. For the self-sterility of grapes, see Bulletin 169, N. Y. Exp. Sta., by S. A. Beach. For plums, see the writings of F. A. Waugh. See *Pollination*.

E. P. SANDSTEN.

SELÌNUM (derivation doubtful). *Umbelliferæ*. About 25 species of rather large perennial herbs, mostly from the northern hemisphere, with pinnately decompound lvs. and compound radiate umbels of small white or rarely yellowish white flowers: petals obovate-emarginate: fr. ovoid or nearly quadrate.

tenuifòlium, Wall (*Oreócome Candòllei*, Edgew.). A hardy perennial with finely cut fern-like foliage and stem often 8 ft. high, branched, with numerous umbels of white fls.: ultimate segments of lvs. narrowly lanceolate, acute: fr. 2–3 lines long, much compressed dorsally, four to six times as broad as thick; lateral ridges much the broadest. India. Gn. 38, p. 221.—Offered as a novelty in America in 1899 and recommended as a foliage plant for single lawn specimens.

F. W. BARCLAY.

SEMECÁRPUS (Greek, *mark* and *fruit;* referring to use of fruit juice). *Anacardiàceæ*. A genus of 20 species of tropical Asiatic and Australian trees with simple, leathery lvs. and small fls. in branching panicles: drupe fleshy, oblong or nearly globose, 1-seeded.

Anacárdium, Linn. f. MARKING-NUT TREE. A moderate-sized deciduous tree with large, oblong or obovate-oblong lvs. 8–24 in. long by 5–10 in. wide: fls. greenish white, ¼ in. across, nearly sessile, in stout branching panicles about the same length as the lvs.: drupe 1 in. long, smooth, black. India.—The black acid juice of the nut is used for printing cotton cloth. Cult. in S. Fla.

E. N. REASONER and F. W. BARCLAY.

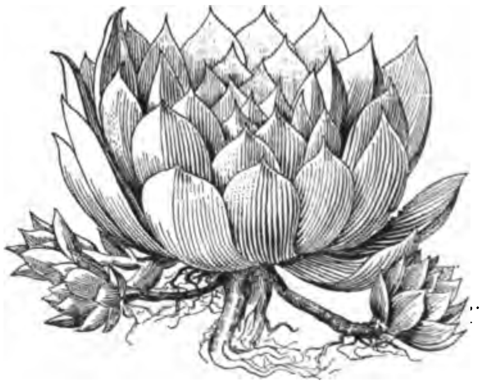
SEMÈLE (mother of Bacchus). *Liliàceæ*. The CLIMBING BUTCHER'S BROOM is a tender evergreen vine which attains a height of 50–60 ft. and is remarkable for bearing its flowers on the margins of the "leaves" instead of on separate flower-stalks. These fls. are small, yellow, 6-lobed blossoms about three-eighths of an inch across. What appear to be leaves are technically "cladophylla," i. e., leaf-like branches. They are organs which have the form and function of leaves but not the morphology. Semele belongs to the small group of 4 genera known as the Asparagus tribe, all the members of which have cladophylla. Semele differs from the Butcher's Broom (*Ruscus*) in having 6 anthers instead of 3 and in having the fls. borne on the margin of the cladophylla instead of along the midrib. Asparagus differs from both in having the fls. not borne on the cladophylla and the filaments free instead of grown into an urn-shaped body.

Semele is a genus of one species, a native of the Canary Islands. The plant is not known to be cult. in American greenhouses, but it is suitable for outdoor cultivation in the South. Franceschi (Santa Barbara) says it looks like a gigantic smilax and has dark green, tropical foliage likely to be mistaken for some of the Indian climbing palms.

andrógyna, Kunth. Scandent, branching: cladodia ovate or ovate-lanceolate, acuminate, leathery: fls. small, yellow, clustered: ovary 3-loculed: berry globose, indehiscent. B.M. 1898 and 3029 (as *Ruscus androgynus*). R.H. 1894, p. 546. G.M. 31:477, 479; 37:261.—The members which have the position of leaves are minute scales, in the axil of which are borne the cladophylla, the latter being 3–4 in. long.

W. M.

SEMPERVÌVUM (Latin, *living forever*). *Crassulàceæ*. HOUSELEEK. About 40 species of fleshy herbs widely scattered in the mountainous countries of the Old World. They are mostly hardy perennials and stemless, and increase by rosettes (Fig. 2310) which are sent out from the parent plant, thereby suggesting the popular name "Hen-and-chickens." The lvs. are thick, short and succulent. The fls., which are borne in panicled cymes, are mostly yellow, greenish yellow, or some shade of rose or purple, rarely white. The individual fls. are larger than those of Sedum, but the clusters are less showy. Houseleeks are cultivated more for foliage than for flowers. They are not used for as great a variety of purposes as Sedums, but they are popular for carpet bedding, rockwork and covering dry banks and bare sandy wastes. They are of the easiest culture and are quickly multiplied by means of the offsets or rosettes. They may be used alone for permanent carpet beds, and for this special purpose are preferable to the more popular but tender Echeveria. The foliage remains green all winter. The lvs. are often spotted with red toward the tip, and this color is brighter if the plants have full sunlight. The names "Houseleek" and "Hen-and-chickens" are loosely applied to the whole genus. If these names are to be restricted, the former should be used for *Sempervivum tectorum* and the latter for *S. globiferum*. The common species, which grows on the roofs of houses in Europe, is *S. tectorum*. In the case of *S. globiferum* the young rosettes are attached to the parent plant by a more slender thread than usual and more easily detach themselves and roll about. The spider-web species are the prettiest of them all, by reason of the webs that cover the young rosettes. These webs are made by the plants themselves and are incidental to development.



2310. Rosette and offsets of a Houseleek—Sempervivum tectorum (× ½).

Sempervivum is closely related to Sedum, but the floral parts are multiples of 6 or some larger number, while the floral parts of Sedum are in 5's. The genus is a difficult one for the botanist. It has been monographed by J. G. Baker in "Gardener's Chronicle" for

1878. Baker's scheme has been closely followed below, but some of the names have been changed.

INDEX.

anomalum, 7.
arachnoideum, 8.
arenarium, 13.
Atlanticum, 4.
calcareum, 2.
Californicum, 2.
expansum, 1.
flagelliforme, 6.
glaucum, 3.
globiferum, 12.
grandiflorum, 10.
Heuffelii, 11.
montanum, 5.
pumilum, 7.
Ruthenicum, 9.
soboliferum, 12.
tectorum, 1.
tomentosum, 8.

SUBGENUS I. SEMPERVIVUM PROPER. *Floral parts in 10's, 12's or 14's. Expanded petals widely spreading.*

Division 1. Rhodanthæ. Fls. reddish.

Group 1. Ciliata. Lvs. of the barren rosettes glabrous on the faces when mature, shortly ciliated on the edges only.

A. *Red-brown tip of lvs. conspicuous.*
  B. *Foliage green or slightly glaucous* .... 1. **tectorum**
  BB. *Foliage very glaucous* .... 2. **calcareum**
AA. *Red-brown tip of lvs. none or obscure.*
  B. *Petals bright red* .... 3. **glaucum**
  BB. *Petals pale red* .... 4. **Atlanticum**

Group 2. Pubescentia. Lvs. of the barren shoots decidedly pubescent on the faces as well as ciliated at the edges, not tipped with a tuft of spreading hairs.

A. *Height 6 in.: fls. numerous, the lowest subsessile* .... 5. **montanum**
AA. *Height 3–4 in.: fls. few, 4–8, all sessile or subsessile.*
  B. *Barren rosettes 1–1½ in. across: fls. bright red* .... 6. **flagelliforme**
  BB. *Barren rosettes 1 in. across at most: fls. mauve-purple* ..... 7. **pumilum**

Group 3. Barbulata. Lvs. of the barren rosettes strongly ciliated on the edge, and furnished with a tuft of similar, not fleecy hairs at the cusp. (*None in our trade.*)

Group 4. Arachnoidea. Differing from the other groups in having the tips of the inner lvs. of the barren rosette connected by fine fleecy threads like those of a spider's web .... 8. **arachnoideum**

Division 2. Chrysantha. Fls. yellow.

A. *Fls. less than 1 in. across: height 6–12 in* .... 9. **Ruthenicum**
AA. *Fls. 1¼–1½ in. across: height 3–4 in* ....10. **grandiflorum**

SUBGENUS II. DIOPOGON. *Floral parts in 6's. Corolla permanently bell-shaped, with ascending close petals.*

A. *Petals not fimbriated: young rosettes not peduncled* ....11. **Heuffelii**
AA. *Petals fimbriated: young rosettes temporarily attached to the mother plant by a slender stalk.*
  B. *Lvs. obovate-cuneate* ....12. **globiferum**
  BB. *Lvs. oblanceolate* ....13. **arenarium**

1. **tectòrum**, Linn. HOUSELEEK. OLD-MAN-AND-WOMAN. Fig. 2310. Height 1 ft.: rosettes 3–4 in. across: lvs. obovate-cuneate, cuspidate, 1½–2 or finally 3 in. long, pale green, with a distinct red-brown tip an eighth to a sixth of an inch long: panicle 5–6 in. long, 3–4 in. wide, composed of 10–12 scorpioid branches: fls. ¾–1 in. across; petals pale red, keeled with deeper red; stamens often changed to pistils; filaments bright purple. Eu., Orient.—Var. **expánsum**, Hort., is said to have broader lvs. and more open rosettes.

2. **calcàreum**, Jord. (*S. Califórnicum*, Hort.). Height under 1 ft.: barren rosettes 2 in. across: lvs. oblanceolate-cuneate, very glaucous, with a distinct red-brown tip, 1–1¼ in. long: panicle 3–4 in. long and broad, with 8–12 scorpioid branches: fls. ¾ in. across; petals pale red, greenish down the keel both on the back and face. Calcareous Alps of Dauphiny.

3. **glaùcum**, Tenore. Height 6–9 in.: barren rosettes 2–3 in. across: lvs. oblanceolate-cuneate, less glaucous than *S. calcareum*, with only a very faint red-brown spot at the tip: panicles 2–3 in. across: fls. 1 in. across; petals bright red. Simplon Alps.

4. **Atlánticum**, Baker. Height nearly 1 ft.: barren rosettes 2–3 in. across: lvs. oblanceolate-cuneate, pale green, hardly tipped red-brown: panicle 3–4 in. across: fls. 1 in. across; petals pale red. Atlas Mts. B.M. 6055 (as *S. tectorum*, var. *Atlanticum*).—The lvs. of the flowering stem are brightly colored with red, excepting towards the base.

2311. Spiderweb Houseleek—Sempervivum arachnoideum. (× ½.)

5. **montànum**, Linn. Height 6 in.: barren rosettes 1½–2 in. across, the new ones few, and borne on red pilose peduncles 1–1½ in. long: lvs. 60–80 in a rosette: panicle very dense, 1½–2 in. across, the lowest fls. nearly sessile: fls. 1–1¼ in. across, bright mauve-red. Fls. about the end of June. Alps, Pyrenees.

6. **flagellifórme**, Fisch. Height 3–4 in.: barren rosettes 1–1½ in. across, the new ones long-peduncled: lvs. 40–50 in a rosette: fls. 6–8 in a dense head, all sessile or nearly so, 1 in. across or more; petals bright red. Fls. early in June, before any other species. Native country uncertain.

7. **pùmilum**, Bieb. (*S. anómalum*, Hort.). Height 3–4 in.: barren rosettes at most 1 in. across, the new ones numerous and short-peduncled: fls. 4–8, in a dense head, all sessile or subsessile, 1 in. across; petals bright mauve-purple. Fls. in middle of June. Caucasus.

8. **arachnoideum**, Linn. COBWEB or SPIDER-WEB HOUSELEEK. Fig. 2311. Height 3–5 in.: barren rosettes ½–¾ in. across, the new ones crowded and sessile: lvs. oblong-cuneate, pale green, the tips of nearly all connected by long, soft, white hairs: panicle dense, few-fld.: fls. less than 1 in. across; petals bright red. Pyrenees to Tyrol. B.M. 68.—*S. tomentòsum*, C. B. Lehm., said to differ in having shorter, more obovate-cuneate lvs. and flatter and more compact rosettes and a denser web, could not be distinguished by J. G. Baker. R.H. 1860, pp. 490, 491; 1898, p. 573.

9. **Ruthénicum**, Koch. Height 6–12 in.: barren rosettes 1½ in. across, new ones few: lvs. 40–50 in a rosette, slightly pubescent glandular on the faces: fls. pale yellow, less than 1 in. across. Eastern Eu.—Rare in cult.

10. **grandiflòrum**, Haworth. The yellow petals are set off by the red-purple filaments: height 3–4 in.: bar-

ren rosettes 1–1½ in. across, the new ones on stalks 1–2 in. long: lvs pale green and pubescent all over, only the very tip red-brown: fls. 1¼–1½ in. across, yellow. Eastern Eu., Asia Minor. B.M. 507 and 2115 (as *S. globiferum*).—The showiest of all the hardy species.

11. **Heúffelii**, Schott. Height 6–8 in.: barren rosettes 1½–2 in. across, not peduncled: lvs. 30–40 in a rosette, obovate-cuneate, the upper third or even half tinted bright red-brown: panicle dense, many-fld., 2½–3 in. across: fls. an inch or less across, pale straw-yellow; petals with 3 small cusps, not fimbriate. Aug. Mts. of Transylvania and Greece, 5,000–6,000 ft.—One of the latest in flower.

12. **globiferum**, Linn. (*S. soboliferum*, Sims). HEN-AND-CHICKENS. HOUSELEEK. Height 6–9 in.: barren rosettes globose, 1–1½ in. thick, the numerous young ones attached to the parent only by a slender thread and easily becoming detached from it and rolling about: lvs. 60–80 in a rosette, obovate-cuneate, the outer ones tipped red-brown, especially on the back: fls. 1 in. across, pale yellow; petals obscurely tricuspidate, conspicuously fimbriated at the edge and on the prominent keel. Mts. of Austria. B.M. 1457.—Unless the young rosettes are thinned out the plants are not so likely to flower. Under the name of *S. globiferum*, Linnæus seems to have confused all the yellow-fld. hardy species which he knew.

13. **arenàrium**, Koch. Very close to *S. globiferum*, having the same height, the same globular deciduous rosette, etc., but with narrower lvs. and the petals larger and more strongly fimbriated: lvs. oblanceolate: fls. 1–1¼ in. across; petals pale yellow, distinctly tricuspidate, with a linear end tooth, strongly fimbriated at the edge and less so on the prominent keel. Tyrol. Gn. 49, p. 220.

R. rupéstris is advertised by one American dealer, but it seems to be unknown to botanists.

W. M.

SENEBIÈRA (after Joh. Senebier, a naturalist of Geneva). *Cruciferæ*. About 6 species of procumbent annual or biennial herbs from the temperate regions of Europe and Asia, and Australia, with alternate, entire or pinnately cut lvs. and small white or rarely purple fls., in short, axillary racemes: sepals short, spreading, equal at the base; stamens free; siliques in pairs, small, laterally compressed; valves 1-seeded, indehiscent.

pinnatífida, DC. A common weed in many parts of the world and sometimes used as a pot-herb in foreign countries: plant ½–1 ft. high: lvs. pinnately lobed: fls. white, small, numerous

F. W. BARCLAY.

SENECA SNAKEROOT. *Polygala Senega.*

SENÈCIO (Latin name for plants of this genus, ultimately from *senex*, "old man"; said to be in allusion to the hoary pappus). *Compósitæ.* GROUNDSEL. The largest genus of plants, comprising some 1,200 species in all parts of the world. A genus comprising so many members and being so widely distributed is necessarily variable and therefore practically impossible of definition. A distinguishing mark of the Senecios lies in the character of the involucre,—scales in one series, and usually reinforced at the base by a row of shorter scales that give the head the appearance of having a small calyx. The heads are usually radiate, the ray-florets being pistillate and fertile; but sometimes the rays are absent and then the head is homogamous (florets all of one kind, i. e., perfect). The disk-florets are tubular and 5-toothed. The torus or receptacle is usually naked. The akenes are mostly terete and ribbed; pappus of soft whitish, often copious bristles. According to Gray, "minute short hairs or papillæ on the akenes of most species swell and emit a pair of spiral threads when wetted. Before wetting, the akenes may be really or apparently glabrous, and after wetting become canescent." Most of the Senecios are yellow-rayed. Of the vast number of species, very few have gained prominence as cultivated subjects. If we omit the greenhouse Cineraria (which is technically a Senecio as understood by Bentham & Hooker), the most popular species are the *Farfugium grande* (properly *Senecio Kæmpferi*) of florists, *S. mikanioides* or German ivy, *S. elegans* or purple ragwort, and *S. Cineraria*, one of the plants commonly known as dusty miller. Various other plants are known as dusty miller, and one of them (Fig. 2312) is sometimes confounded with *Senecio Cineraria.*

All other species are of very minor importance to the horticulturist. Of the 60 or more species native to the United States and Canada, about a half dozen have been offered by dealers in native plants, but they are practically unknown horticulturally. Most of the species are wholly herbaceous, but in South Africa and South America many species are shrubby. Some species are even arborescent; others are climbers. In South Africa and the Canaries is a set that has been separated as Kleinia, distinguished mostly by its habit, being for the most part fleshy shrubs or herbs, with terete or angular stems and whitish or pale yellow rayless flowers. Species of this group are sometimes seen in collections of succulents, but they are little known outside of botanic gardens. *S. vulgaris*, Linn., from Europe, is a common annual weed in various parts of this country. To Senecio belong the genera known to gardeners as Erythrochæte, Farfugium, Jacobæa, Kleinia, Ligularia. Cineraria is also a Senecio, but the florist's Cineraria is described under that name in Vol. I of this work. Bentham & Hooker refer to Senecio the genus Cacalia, which is kept distinct by American botanists. Hoffmann (in Engler & Prantl's Natürlichen Pflanzenfamilien) refers the garden genus Emilia to Senecio, but keeps Ligularia (including Farfugium) and Cineraria distinct. For *S. conchifolius*, see *Emilia.*

2312. Artemisia Stelleriana, one of the Dusty Millers sometimes confused with Senecio Cineraria. See Fig. 2315.

Since Senecios afford both greenhouse and hardy border plants, it is impossible to give general cultural directions. The species are not difficult to manage, however, and most of them propagate readily by means of greenwood cuttings and seeds; the hardy species may be divided.

INDEX.

acanthifolius, 9.
albus, 5.
Anteuphorbium, 1.
argenteus, 2.
articulatus, 1.
aureo-maculatus, 2.
aureo-marginatus, 9.
aureus, 14.
Bolanderi, 16.
candidissimus, 9.
Cineraria, 9.
Doria, 12.
cruentus, 4.
Douglasii, 17.
elegans, 5.
erectus, 5.
Erythrochæte, 3.
exaltatus, 13.
Farfugium, 2.
fastigiatus, 15.
grande, 2.
Jacobæa, 5.
Japonica, 3.
Japonicus, 3.
Kæmpferi, 2.
Ligularia, 2, 3.
lugens, 13.
macroglossus, 8.
maculatum, 2.
maritima, 9.
mikanioides, 7.
palmatifida, 3.
Palmeri, 10.
Petasitis, 11.
pulcher, 6.
purpureus, 5.
scandens, 7.
spinulosa, 1.
suspensa, 1.

A. *Stem fleshy, with jointed and swollen branches: heads rayless* .... 1. **articulatus**

AA. *Stem not fleshy.*

B. *Scales of involucre somewhat overlapping and appearing as if 2-ranked: stigma rounded, the style-branches hairy: plants grown for foliage.* (*Ligularia, Farfugium.*)..... 2. **Kæmpferi**
3. **Japonicus**

BB. *Scales of involucre usually strictly 1-seriate: stigma short, the style-branches hairy only at the tip.*

C. *Flowers purple (there are white garden forms).*

D. *Lvs. large and palmately veined: lobes shallow or none*.................... 4. **cruentus**

DD. *Lvs. medium, elongate, pinnate-veined or pinnate*.................... 5. **elegans**
6. **pulcher**

CC. *Flowers yellow.*

D. *Plant climbing*............ 7. **mikanioides**
8. **macroglossus**

DD. *Plant not climbing, usually less than 2 ft. high.*

E. *Herbage white-tomentose throughout*............ 9. **Cineraria**
10. **Palmeri**

EE. *Herbage green or at most only grayish, not white-tomentose.*

F. *Lvs. large, palmately veined*..............11. **Petasitis**

FF. *Lvs. oval-oblong and dentate, the cauline ones decurrent*......12. **Doria**

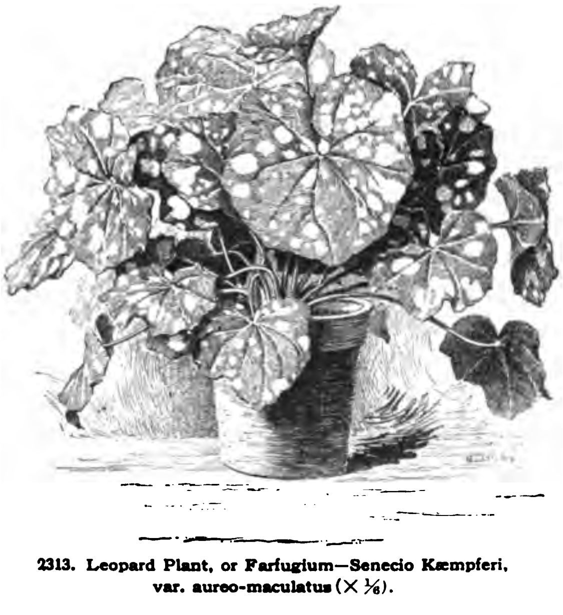
FFF. *Lvs. small or ordinary, pinnately veined or divided.* (*Native American species, as characterized by Gray.*)...13. **lugens**
14. **aureus**
15. **fastigiatus**
16. **Bolanderi**
17. **Douglasii**

1. **articulàtus**, Sch. (*Kleinia articulàta*, Haw.). CANDLE PLANT. Plant branching, glabrous and fleshy, 1–2 ft. high, the branches swollen at intervals: lvs. flat and fleshy, petiolate, laciniate or runcinate, with acuminate lobes: heads discoid and all the florets perfect, white, in small corymbs on naked peduncles: akenes downy. S. Afr.—Perhaps the commonest Kleinia in cultivation, being grown with coolhouse succulents. *S.* (*Kleinia*) *Anteuphorbium*, Sch., is sometimes seen in collections, although it is not known to be in the American trade. It is a glabrous shrub 3–4 ft. high, with fleshy stems constricted at the joints, small, erect, fleshy, entire lvs. that are decurrent on the stem, and solitary cylindric yellow-fld. heads (with rose tinge) an inch long. B.M. 6099. According to J. D. Hooker, this plant "is one of the oldest Cape plants in cultivation, having, according to Dodonæus, been brought to Europe in 1570, and cultivated in England in Gerard's garden in 1596. * * * The name *Anteuphorbium* was given because of its being a reputed antidote against the acrid poison of the Cape Euphorbium." The names *Kleinia spinulosa* and *K. suspensa* have appeared in the American trade, but they are unidentifiable.

2. **Kǽmpferi**, DC. (*Ligulària Kǽmpferi*, Sieb. & Zucc. *L. Farfùgium*, C. Koch. *Farfùgium Kæmpferi*, Benth.). Rhizomatous perennial sending up many lvs. on slender, flocculent-woolly petioles: lvs. large (often 6–10 in. across), orbicular to nearly reniform, cordate at base, angular-toothed, green: fl.-stems 1–2 ft. tall, flocculent-woolly, branched, with only small, bract-like lvs.: heads large, with light yellow rays spreading 1½–2 in. across: pappus white and copious. Japan. B.M. 5302. —Var. **aùreo-maculàtus**, Hort. (*Farfùgium gránde*, Lindl. *F. maculàtum*, Hort.). LEOPARD PLANT. Fig. 2313. Differs in having the lvs. blotched with yellow or white and sometimes with light rose. The variety *aureo-maculatus* is the only form in general cultivation. It was introduced to England in 1856 "from the garden of a mandarin in the north of China" by Fortune. Twenty years ago this was a common plant in conservatories and window-gardens, but of late years it has been neglected. It is, however, a most worthy plant, not only for the house but for bedding in the open in shady places. The plant is hardy as far north as Washington when set permanently in the open. One form has yellow-spotted lvs. (the commoner) and another has white-spotted lvs. Another form (var. *argenteus*) has lvs. glaucous-green edged with creamy white. Easily propagated by division.

3. **Japónicus**, Sch. (*Ligulària Japónica*, Less. *Erythrochæte palmatifida*, Sieb. & Zucc.). Strong perennial herb, growing 5 ft. high (said to reach 15 ft. in southern Japan), and grown for its massive foliage effect: radical lvs. very large, 1 ft. or more across, deeply palmately cut into 7–11 narrow lobed and notched divisions: fl.-stems branched, bearing heads on rather long, naked stems: rays orange, spreading, 3 in. from tip to tip. Japan. Gn. 22, p. 139.—Intr. into this country about twelve to fifteen years ago. It is a bold plant, hardy in New York, and well adapted to planting where strong foliage effects are desired, provided the place is moist.

4. **cruéntus**, DC. (*Cinerària cruénta*, Mass.). Low short-stemmed perennial, floccose-woolly: lvs. large, cordate-ovate to cordate-triangular, angled or undulate and sinuate-toothed, rather long-stalked: fls. purple-red. Canary Isl.—The supposed parent of the florists' Cinerarias, for discussion of which see p. 318, Vol. I.



2313. Leopard Plant, or Farfugium—Senecio Kæmpferi, var. aureo-maculatus (× ⅙).

5. **élegans**, Linn. (*S. purpùreus*, Hort. *Jacobæa élegans*, Moench). PURPLE RAGWORT. Annual, viscid-pubescent, erect or diffuse, 1–2 ft.: lvs. various, mostly oblong in outline, pinnate, lobed or toothed, the sinuses mostly broad and rounded, clasping at the base: heads in loose corymbs, the rays purple, disk-fls. yellow. S. Afr. B.M. 238.—Var. **eréctus**, Harvey. Stem slender but erect, the lvs. pinnate or 2-pinnatifid. *Senecio elegans* is an old garden plant. A common form of it has double fls. Var. **álbus**, Hort., has white fls.

2314. Senecio mikanioides, usually called German Ivy. (× ⅙.)

6. **púlcher**, Hook. & Arn. Robust, 2–4 ft., white-cobwebby, the stem simple or nearly so and scarcely leafy: lvs. long (4–10 in.), oblong-lanceolate, thick, shallow-lobed and crenate-toothed: heads 2–3 in. across, with many long, red-purple rays and a yellow disk. Uruguay and Argentina. B.M. 5959. R.H. 1877, p. 94; 1896, p. 329. Gn. 49, p. 122. G.M. 40:745.—A very bold species, with striking erect habit and large fls. in summer. Perennial, although it has been described as annual. In protected places and well-drained soils, it is hardy in southern New England.

7. **mikanioides**, Otto (*S. scándens*, DC.). GERMAN IVY. Fig. 2314. Slender and glabrous, tall-twining: lvs. ovate or deltoid-ovate in outline, mostly with a deep basal sinus, sharply 5–7-angled or angle-lobed: head small, discoid, yellow, in close clusters on axillary and terminal branches. S. Afr.—Very common conservatory and window-garden plant, easily propagated by cuttings.

8. **macroglóssus**, DC. Lvs. mostly hastate, often with acuminate basal lobes, but various in shape: heads only 1–3 together, and bearing yellow rays. S. Afr.

9. **Cinerària**, DC. (*Cinerària marítima*, Linn. *Senècio acanthifòlius*, Hort.). Fig. 2315. Perennial, 2 ft. or less tall, branching from the base, very white-woolly throughout: lvs. pinnatifid, with oblong and obtuse segments: heads small, yellow, in small, compact corymbs, rayless. Europe. F.M. 1872:52.—Var. **candidíssimus**, Hort., has very white foliage. Var. **aureo-marginàtus**, Hort., has lvs. bordered with orange-yellow. *S. Cineraria* is an old-fashioned garden plant, sometimes known as Dusty Miller; the commoner Dusty Miller is *Lychnis Coronaria*, and another one is *Artemisia Stelleriana* (Fig. 2312).

10. **Pálmeri**, Gray. Densely white-tomentose all over, branching, 1–2 ft., perennial: lvs. oblong-lanceolate, slightly toothed, narrowed into a petiole: heads few, with yellow rays, about 1 in. in diam., in a corymb. Guadalupe Isl., Lower Calif.—Intr. by Franceschi, Santa Barbara.

11. **Petasìtis**, DC. (*Cinerària Petasìtis*, Sims). Fig. 2316. Robust perennial, 2–3 ft. tall, gray-floccose on the young parts, branching: lvs. both radical and cauline, 6–10 in. across, long-stalked, cordate-ovate-orbicular, strongly several nerved, shallowly many-lobed, dull green above but gray-tomentose beneath: heads in a long open panicle, the cylindrical involucre ⅜ in. high, the few rays light-yellow. S. Amer. B.M. 1536.—A striking plant for winter decoration, the star-like fls. (or heads) being produced in great abundance; now becoming disseminated in this country.

12. **Dòria**, Linn. Erect, 3–4 ft.: radical lvs. oval-oblong, dentate, somewhat glaucous, stalked; stem-lvs. oblong-lanceolate, sessile and somewhat decurrent: heads yellow, with 5 or 6 rays. Eur. Hardy perennial.

13. **lùgens**, Rich. Perennial: floccose-woolly when young but becoming nearly or quite glabrous, 6–24 in. tall, the stem practically naked above: lvs. spatulate to oval or oblong, repand-denticulate: rays 10 or 12, yellow, conspicuous. Western U. S. in the mountains and to Alaska.—Var. **exaltàtus**, Gray, has been offered: 1–3 or 4 ft. tall: lvs. thickish, longer-petioled, abrupt or subcordate at base.

14. **aùreus**, Linn. Perennial: an exceedingly variable and cosmopolitan group, by some authors split into several species, some glabrous, 1–2 ft. tall: lvs. mostly rounded and undivided, the cauline ones lanceolate and pinnatifid or laciniate: heads many, ⅛–½ in. high, with 8–12 conspicuous yellow rays. Moist places, nearly throughout the U. S.

15. **fastigiàtus**, Nutt. Perennial: mostly pubescent, the stem strict and simple and 1–2 ft. high: lvs. all entire or very nearly so, lanceolate or spatulate-lanceolate, obtuse: heads ⅛–½ in. high, with conspicuous yellow rays. Idaho, Oregon, Washington.

16. **Bolánderi**, Gray. Perennial: glabrous or soon becoming so, the stems weak and slender and 6–30 in. tall: lvs. thin, palmately 5–9-lobed or incised, or the stem-lvs. pinnately divided: heads several, ⅓–½ in. high, with 5–8 rather long yellow rays. California, Oregon.

17. **Doùglasii**, DC. Fig. 2317. Woody or even shrubby at base, with many stems, 2–3 ft. tall, with the aspect of an aster: lvs. small and linear, or the lower ones pinnately parted into filiform divisions: heads numerous, ⅛–½ in. high, with 8–18 conspicuous yellow rays. Nebr., W.

L. H. B.

SENNA. See *Cassia*.

SENNA, BLADDER. *Colutea*.

SENSITIVE BRIER. See *Schrankia*.

SENSITIVE FERN. *Onoclea sensibilis*.

SENSITIVE PLANT. *Mimosa pudica*.

2315. Senecio Cineraria.
One of the plants known as Dusty Miller.

SEQUÒIA (after Sequoyah, otherwise George Guess, a Cherokee half-breed of Georgia, about 1770–1843, inventor of the Cherokee alphabet). *Coniferæ*. BIG TREES OF CALIFORNIA. REDWOOD. Tall, massive, often gigantic forest trees, with trunks usually heavily buttressed at base, covered with thick, fibrous bark, deeply and widely lobed; heartwood dark red, soft, durable, straight-grained; sapwood very thin and nearly white: lvs. persistent, alternate, often dimorphic (especially on young trees): fls. naked, monœcious, solitary, the staminate terminal or axillary; stamens numerous: cones maturing in one season. Once widely distributed in several species throughout the interior of North America and parts of Europe, but now limited to two species, which are confined to the mountains of California.

The wood of *S. sempervirens* at present forms the bulk of the redwood lumber in the trade, and is used on the Pacific coast wherever a light, durable, easily worked material is desired. Most wooden buildings are constructed with this lumber in California, and it is sometimes exported to Europe to be employed as a substitute for red cedar in the manufacture of lead-pencils. Logs with a curly grain are highly prized by cabinet-makers, from whom they have received the name "curly redwood."

The wood of *S. gigantea* resembles that of *S. sempervirens*, but is coarser-grained and lighter (in weight), and is therefore not adapted to as wide use as the latter. It is very durable in contact with the soil, however, and is widely used for coarser construction work, ties, fence-posts, vineyard stakes, shingles, and the like.

As an ornamental subject, *S. sempervirens* will be valuable wherever it is hardy. It is rather insistent upon a cool, moist, foggy climate, however, and is in this respect inferior to the other species, although a variety known as *S. sempervirens*, var. *glauca*, is reported to be doing well in southern California.

S. gigantea has been more widely planted in the East and in Europe, and in sheltered locations has maintained itself for a number of years. The most notable examples are those in the Ellwanger & Barry grounds, at Rochester, N. Y., which are now about 40 yrs. old, 30 ft. high and 12 in. in diameter at base of trunks. When seen in the winter of 1900–1, however, these trees were beginning to show the effects of the rigorous climate by their dead and dying tops. This species is far more hardy than *S. sempervirens*, and even in the dry climate of southern California is reported to be doing very well. A weeping variety known as *S. pendula* is advertised, which originated some years ago in European nurseries, and is described as having "all pendulous branches, closely pressed against the stem." Both species are said to dislike heavy soils, and to thrive best when planted in deep sandy loam. Both are easily propagated from seed, which sprout readily in a few weeks.

2316. Senecio Petasitis (× ⅙).

2317. Senecio Douglasii (× ¼).

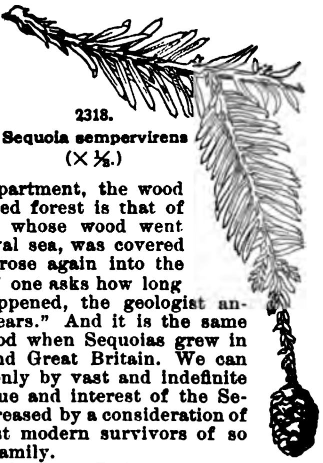
A. *Lvs. dimorphic, usually 2-ranked: buds scaly.*

sempérvirens, Endl. CALIFORNIA REDWOOD. Fig. 2318. Tree, 200–400 ft. and more high, with a slightly tapering trunk, 10–20 and sometimes 25 ft. in diam., and often clear of branches for over 100 ft.: branchlets and lvs. distichously spreading, the latter persistent for two or three years and sometimes dimorphic on the same branch, the larger ¼–¾ in. long, the smaller scale-like: cone oblong, ¾–1 in. long, ½ in. broad, and persistent after opening and discharging the seed. Confined to northern and central Coast Ranges of California on slopes exposed to sea influences. S.S. 10:535.—When cut, or from fallen stems, it throws up many vigorous long-lived shoots, often producing merchantable trees.

AA. *Lvs. seldom or not at all dimorphic, not 2-ranked, often imbricate: buds naked.*

gigantèa, Decne. (*S. Wellingtònia*, Seemann). CALIFORNIA BIG TREE. Fig. 2319. Tree, 200–350 ft. high, with heavy massive trunks, sometimes 20–30 ft. in diam. and often clear of branches for over 150 ft.: bark of old trees from 1–2 ft. thick; branchlets hardly distichously arranged, pendulous, cord-like, forming rather tangled masses: lvs. ⅛ to ¼ in. and sometimes ½ in. long on stout shoots, and usually closely appressed and scale-like: cone ovate-oblong, 2–3½ in. long, 1–2¼ in. thick, opening only slightly, retaining its original form even when dry, and persistent. Western slopes of Sierra Nevada. S.S. 10:536. ARNOLD V. STUBENRAUCH.

Taxodium was the group in which *Sequoia sempervirens* was at first placed by Lambert from the specimens obtained by Menzies in 1795, and it remained there until 1847, when Endlicher established Sequoia for its reception. The type-species of Taxodium is *T. distichum*, the deciduous cypress. Like nearly all taxads, the deciduous cypress has a very ancient relationship among fossil trees; it once grew on a large part of western Europe and portions of England. Forms of Sequoia, whose ancient history constitutes one of the most interesting chapters in fossil botany, once grew in immense forests in Europe, Asia and North America. The first fossil remains occur in the lower chalk-formations and increase in extent to the tertiary strata, in which they are numerous. In miocene times, fossil Sequoias extended "from the Hebrides to the Steppe of Kirghis." Asa Gray and others have told the story of the rise and fall of this great and strong family of conifers, once as powerful as any tree-group in the world, but cut off, swept away and destroyed by the glacial age until only the local conditions prevailing in the Coast Range and Sierras of California preserved the two remaining species to the present time. According to Gray, *S. Langsdorfii*, the Sequoia which is found in the miocene in Europe, appears in the miocene of Alaska, Greenland, Spitzbergen and Iceland, and it much resembles *S. sempervirens*. Another fossil species, *S. Sternbergii*, found in Greenland, seems to have been the ancient representative of *S. gigantea*. According to the investigations of the United States Geological Department, the wood of the Arizona petrified forest is that of a species of Sequoia, whose wood went down under a primeval sea, was covered with sandstone, and rose again into the present continent. If one asks how long ago these things happened, the geologist answers, "Millions of years." And it is the same in regard to the period when Sequoias grew in Greenland, Siberia and Great Britain. We can measure that period only by vast and indefinite epochs. But the value and interest of the Sequoias are greatly increased by a consideration of their place as the last modern survivors of so powerful an ancient family.



2318. Sequoia sempervirens (× ⅙.)

At the present time the Coast Redwood occupies only a narrow belt of country near the ocean, nor is it continuous even there; the Giant Redwood, or California Big Tree, exists only in a few small and isolated groves, covering in all less than fifty square miles along the western side of the Sierra Nevada range. Compared with the enormous territory once occupied by species of Sequoias, the modern representatives of this ancient and honorable family are reduced to a very small area.

The first known of the Sequoias, and much the more valuable species, economically speaking, was *S. sempervirens*, the Coast Redwood of California. This is one of the most important timber trees of the world, and its forests, comparatively limited in area, have yielded and are yielding the most easily obtained, the most durable and most profitable fencing and building lumber of the Pacific coast. The reproductive powers of the tree are enormous; no other known conifer so persistently sprouts from the stump, so rapidly makes new forest, or so well resists fire. But it does not thrive farther inland than the limits of the sea-fog, and a large part of the original area covered by this noble tree has been denuded by successive fires and destructive lumbering methods. Small Redwood forests occur in Monterey county, but the most southern forests of commercial importance are in Santa Cruz. The belt, broken by the Bay of San Francisco, extends north through Marin, Sonoma, Mendocino, Humboldt and Del Norte to the southern borders of Oregon. The real Redwood forests are all contained within a strip of coast lands 500 miles long and rarely more than 20 or 25 miles wide. The actual bodies of Redwood within this region are merely a chain of isolated groups separated by clearings or by large areas on which Redwoods never grew. A small grove, now practically destroyed, existed fifty years ago on the east side of the Bay of San Francisco, in Alameda county. Well-borers have found Redwood logs in a perfect state of preservation in various parts of the Coast Range far south of where the tree now grows, even to Los Angeles and San Diego, showing that in some former period of greater rainfall and more sea-fog, Redwood forests extended much farther along the coast.

The climate where the Redwood thrives is comparatively equable, marked by cool summer winds from the southwest. The tree delights in rich, sheltered mountain valleys and fertile slopes, in dripping fogs and in heavy winter rains. Going east from the ocean, in the Redwood region, one suddenly comes to the top of a ridge, to overlook oaks and pines, and at once reaches the plainly marked edge of the *Sequoia sempervirens* forest.

While *S. sempervirens* is sometimes called second in size among the giant conifers of the Pacific coast, the tallest tree yet authentically measured was 340 ft. high, exceeding in height the tallest of the Sierra species, and it is probable that trees exist which rise to nearly 400 ft. and so deserve to take the first place among the conifers. Many trees of 20 and even 22 ft. in diameter at five feet from the ground, and from 300 to 325 ft. in height, are still standing in the Redwood forests. The finest groves of Redwoods contain many specimens that range from 150 to 250 ft. or more in height and have a diameter of from 12 to 18 ft. In such forests the trunks rise in clear, red-brown shafts to a height of from 75 to 150 ft. before they branch; they stand so close that the masses of timber that exist on each acre are greater than are found in any other known forest, and through their far-distant tops the sun seldom reaches the warm, sheltered soil of the great Coast Range Cañons. With proper management, under the principles of scientific forestry, the Redwood region as it exists to-day could be maintained, and its future yield greatly increased, but otherwise in forty or fifty years the commercial value of the entire area will be practically destroyed. The state of California has this year (1901) appropriated $250,000 for the purchase of the large Redwood forest of the "Big Basin" in Santa Cruz county, and a commission is now arranging to create a State Redwood Park there.

Sequoia sempervirens was discovered by Archibald Menzies in 1795, rediscovered by David Douglas in 1831, and soon after by Dr. Coulter. It was introduced to European gardens by Hartweg about 1847. Both Douglas and Hartweg were sent out by the Royal Horticultural Society of London. *S. sempervirens* var. *adpressa* (Carrière) is a smaller tree than the type form, with creamy white younger leaves and more glaucescent older leaves. It is called in California the "White Redwood" and the "Silver-leaf Redwood." Other horticultural varieties in cultivation are known as *Sempervirens gracilis*, *S. taxifolia*, *S. picta*, *S. albo-spica* and *S. glauca*. The golden forms found in many other conifers occasionally appear, but cannot yet be called fixed. No really dwarf Redwood is yet extant. Larger-leaved or more compact forms can be selected from the forest, and the tree responds easily to selection and culture. It thrives in gardens in the Sacramento valley, in the Sierra foothills and in many parts of southern California, so that its range for ornamental uses can be greatly extended on the Pacific coast. It has been largely planted in Europe, particularly in English parks, and, as was to have been expected, does best in well-drained rich soil near the ocean but sheltered from cold winds.

2319. Sequoia gigantea (× ⅓).

Endlicher's *Sequoia gigantea* (the *S. Washingtonia* of Sudworth and the *S. Wellingtonia* of Seemann and of Sargent) is undoubtedly one of the rarest of all living species of trees, and one of the most easily visited and studied. It is the best living representative of a geologic age long passed away. Besides this, it is the most impressive and noble of all known trees. But nearly all of the small remaining group of Big Trees except the Mariposa groves are owned by private individuals and are being cut down or may at some future time be destroyed. The famous Calaveras grove, which is historically and scientifically of the most interest of any Big Tree group, was in 1899 bought by a lumberman who expects to convert the trees into timber unless he "gets his price" from the state of California, the general government or some public-spirited association. Some fine Sequoias are in the Sequoia and General Grant national parks, but private timber claims hold many of the best trees here, and sawmills are now at work in this region.

The resistance offered by this wonderful species to fire, old age and decay is unique, but it reproduces itself with extreme difficulty. The seeds, even under favorable circumstances, have a very low vitality, and one seldom finds a single young tree in the *Sequoia gigantea* groves, excepting on the south fork of the Kaweah and on the branches of Tule river. The preservation of these magnificent trees is a matter of the utmost interest, especially to Americans. Some of them appear, from an examination of the stumps, to have lived not less than 4,000 years. Muir estimates the age of some living trees at 5,000 years; one observed by Asa Gray, 24 feet in diameter, was about 1,600 years old. There is an extensive and rapidly increasing literature of the Sequoias not only in English, but in other languages.

The present condition (1901) of the nomenclature of the famous California "Big Tree" is unfortunate. According to a strict interpretation of the Rochester Code, Decaisne's name, *S. gigantea*, must be discarded, because in 1847 Endlicher named the Coast Redwood *Sequoia gigantea*, thus preventing that term from use again in the same genus. This being admitted, botanists would certainly have to take Seemann's *S. Wellingtonia* (1855), were it not for Dr. Winslow's suggestion in 1854 that "if the tree is a Taxodium let it be *Taxodium Washingtonianum;* if a new genus, *Washingtoniana Californica*." This appeared in the "California Farmer," and is open to the criticism that it lacked technical procedure in description. It is only upon Dr. Winslow's letter to the "California Farmer" that Sudworth and others base their *Sequoia Washingtoniana*. Rejecting this, Sargent and most continental authorities prefer *S. Wellingtonia*. The retention of *S. gigantea*, however, by an exception to the Rochester rules, would seem to involve fewer difficulties than the acceptance of either of the newer names. CHARLES HOWARD SHINN.

SERADELLA. See *Serradella*.

SERÀPIAS (ancient name of an orchid derived from Serapis, an Egyptian divinity). *Orchidàceæ*. Terrestrial herbs with the habit of Orchis. Four or 5 species are known from the Mediterranean region. Sepals connivent in the form of a helmet; petals included, small; labellum not spurred, with erect lateral lobes and a larger undivided middle lobe; pollinia with a common viscid disk; rostellum laterally compressed. The following species are among the best known.

Keep the plants partially dry during winter months. Give plenty of water when in vigorous growth. Pot them in leaf-mold, loam and sand.

Lingua, Linn. Stem erect, up to 1 ft. high, bearing several narrow, acute lvs.: sepals lanceolate, greenish or purplish; labellum much longer; lateral lobes rounded, erect, middle lobe oblong-lanceolate, acuminate, smooth, red. Mediterranean region. B.M. 5868,B.

cordigera, Linn. Resembles the preceding species in habit: labellum brownish red, middle lobe ovate, acuminate, subcordate at the base, pilose. Mediterranean region. B.M. 5868, A. R.H. 1892:390. G.C. II. 20:341.

S. elongàta, Hort. Brown; lip large; little known to botanists.

HEINRICH HASSELBRING and WM. MATHEWS.

SERENÆA (after Sereno Watson, distinguished American botanist). Also written *Serenoa*. *Palmàceæ*. Low, spineless, cespitose palm with creeping branched caudex clothed with the fibrous bases of the leaf-sheaths: lvs. terminal, orbicular, coriaceous, deeply plicate-multifid, glaucous beneath, with narrow bifid infolded segments; rachis none; ligule short; petiole plano-convex, dentate on the margins: spadix long, tomentose, the flexuous rachis covered with deeply obliquely fissured, tubular sheaths, the spreading branches branched, the alternate branchlets very slender: spathes many, sheathing the peduncle: bractlets minute: fls. white: fr. ovoid, black, an inch long. Species 2. Florida to S. Carolina.

serrulàta, Hook. f. SAW PALMETTO. Fig. 2320. Stem creeping, branching, 4–8 ft. long: lvs. 2–4 ft., circular in outline, fan-shaped, shorter than the slender, spiny-edged petiole; segments slightly cleft at the apex, without thread-like filaments: spadix densely tomentose, shorter than the lvs.: drupe black, ⅔–¾ in. long.

2320. A Florida scene, with Serenæa serrulata in foreground and Palmettoes in the background.

arboréscens, Sarg. Tree, 30–40 ft. high, with 1 or several stems: lvs. semiorbicular, truncate at base, yellowish green above, bluish green below, 2 x 2 ft., divided nearly to the base into narrow linear-lanceolate lobes.—Discovered by P. W. Reasoner in 1887. First described 1899. Differs from above in arborescent habit, more elongated spadix, much smaller fls. and smaller, globose fruit and seeds. Southwestern Fla.

JARED G. SMITH.

The Saw Palmetto is the native creeping fan-leaved palm. Those who are clearing land in Florida consider it a nuisance. It is, however, of great interest to northern tourists, many of whom like to take home a small Florida palm in a pot or tub. This species does very well in pots, though it is of slow growth. Relatively speaking, it is very hardy, as it will stand a temperature of 10° F. The leaves of the Saw Palmetto, both fresh and dried, are sent north in great quantities for Christmas decoration. The "crowns" are also largely used for the same purpose and deserve a greater popularity. Crowns are whole tops cut off; they have no roots, and only a part of the stem. They give the effect of the whole plant and are therefore much more desirable for some purposes than single leaves. They will last for weeks, if kept moist, in the shade and free from drafts. Crowns 3–5 ft. high are considerably used for large decorations at Christmas, Palm Sunday and Easter.

E. N. REASONER.

In clearing the land for the writer's garden one large clump of the Saw Palmetto was purposely retained. At present it makes a striking appearance, somewhat weird and grotesque. The fertilizer which the plant received has improved it wonderfully. Good specimens attain a height of about 8 feet. There is a variety showing a glaucous tone which grows near the coast and which is very beautiful. It seems to be difficult to transplant.

Clumps of Saw Palmettos often consist of 10 to 20 low stems and end in hundreds of widespread, many-fingered leaves. They are the hiding-place of many small birds, rabbits and even rattlesnakes.

H. NEHRLING.

SERENÒA. See *Serenæa.*

SERICOCÁRPUS (Greek, *silken fruit*). *Compósitæ.* A genus of 5 species of perennial herbs from northwestern United States closely allied to Aster and scarcely distinguishable from the section Biotia of that genus. The akenes are not so strongly compressed as in Aster. The flower-heads have white rays and pale yellow disks which sometimes become purplish. *S. rigidis*, Lindl., was offered in 1881 in the eastern states by western collectors, but it is doubtful if any member of the genus is in cultivation.

SERÍSSA (from the Indian name). *Rubiàceæ.* A single species from southeastern Asia, a tender shrub of moderate growth with small, opposite, nearly sessile lvs. and rather small, jasmine-like white fls. which are sessile in the leaf-axils or terminal: corolla funnel-shaped, 4–6-lobed, the lobes 3-lobed; stamens inserted on the corolla-tube; style shortly 2-cleft: fr. subglobose, 2-celled, 2-seeded.

fœ́tida, Lam. (*S. Japónica*, Thunb.). The young lvs. are ill-smelling if crushed. Summer. B.M. 361.—Offered by importers of Japanese plants. Var. **variegàta** has yellow-margined lvs. Offered in 1895 by Pitcher & Manda.

F. W. BARCLAY.

SERPENT GOURD. See *Trichosanthes.*

SERRADELLA is an annual leguminous plant which is valuable as a fodder plant on dry and sandy sterile soils. It may be used for pasture or for hay. It is sometimes cut twice in a season. Sometimes it is sown with winter rye. The plant is figured in Bulletin 2. Div. of Agrostology, U. S. Dept. Agric., where Jared G. Smith says: "At the Pennsylvania station the yield from two cuttings was 11½ tons of green forage. It does not require lime, and is often used as a green manure to bring up the value of sterile fields. The forage, which is much relished by cattle and sheep, has about the same feeding value as red clover."

The scientific name of Serradella is *Ornithopus sativus*. The generic name means "bird's foot," referring to the clusters of long, claw-like pods. The genus contains about 7 species of slender, low-growing annuals with pink, white or yellow fls. which are too minute to have any horticultural value. Lvs. odd-pinnate; lfts. numerous.

W. M.

SERVICE-BERRY is *Amelanchier*

SERVICE-TREE. See *Sorbus.*

SESAME. See *Sesamum.*

SÉSAMUM (Greek name taken by Hippocrates from the Arabic). *Pedaliàceæ.* A genus of annual herbs from India and Egypt, allied to Martynia, with solitary, axillary flowers. The only species of importance is *S. Indicum*, which has been extensively cult. in Asia and Africa from ancient times. The seeds are sold in America under the name of Bene. They yield about half their weight of oil-of-sesame (known also as benne-, gingili-, or teel-oil), which is odorless and does not easily become rancid. This oil is universally used in India for cooking and anointing. Large quantities of oil and seed are imported from India to Europe for the manufacture of soap and adulteration of olive-oil. Also cult. in northern states as a medicinal herb, the mucilaginous leaves being used in dysentery and diarrhœa of children. The oil of Sesamum, however, which is expressed from the seeds is in large doses a laxative.

Índicum, Linn. (*S. orientàle*, Linn.). Lvs. variable, 3–5 in. long, oblong or lanceolate, the lower often 3-lobed or parted: corolla pale rose or white, 1 in. long, tubular, 5-cleft, the 2 lobes of the upper lip shorter. July. B.M. 1688.—White- and black-seeded varieties have been known for at least two centuries. Runs wild in the extreme South.

W. M.

SETÀRIA (*seta*, a bristle; referring to the bristles below the spikelets). *Gramíneæ.* Hackel places the number of species at 10, but Scribner and Merrill describe 28 species from North America alone (under the genus name Chætochloa). Warmer countries of the world. Includes several weedy species, the foxtail grasses, *S. glauca*, *S. viridis*, and others, and the foxtail millets. The culture of Millet dates from prehistoric times. At present it is raised extensively in parts of Asia as a food plant. In the United States, Millet is raised for fodder. There are several groups of varieties grown here, Common, German, Golden Wonder (all of which belong to *Setaria Italica*), and Hungarian Grass, which is referred to *S. Italica*, var. *Germanica.* New Siberian Millet is probably a distinct variety. The "Japanese Millets" belong to *Setaria Italica*, while the "Japanese Barnyard Millets" belong to *Panicum Crus-galli.*

Spikelets, as in Panicum, awnless, but provided at base with a cluster of rough bristles which extend beyond the spikelets. The bristles persist on the axis after the spikelets have fallen. Inflorescence a dense, cylindrical, spike-like panicle, which becomes quite compound in some of the cultivated varieties. The seed is inclosed in the flowering glume, which is usually finely transversely wrinkled, a character which distinguished the fruit from other similar grasses. The generic name of these grasses is confused. By some they are referred to Ixophorus, and by others, more recently, to Chætochloa.

Itálica, Beauv. COMMON MILLET of the United States but not of Europe, which is *Panicum miliaceum.* An annual: culm 3–5 ft. high: spike yellow or purple; bristles 1–3, often shorter than the spikelet. Thought to have been derived from *S. viridis.* Gn. 12, p. 69.

Var. **Germánica**, Richt. (*Pánicum Germánicum*, Mill. *Setària Germánica*, Beauv. *S. macrochæta*, Schult). HUNGARIAN GRASS or MILLET. A smaller form more nearly approaching the wild *S. viridis:* bristles much longer than the spikelets.

macrostàchya, HBK. (*S. Alopecùrus*, Fisch. *S. alopecuroìdes*, var. *nìgra* of the trade). An erect or ascending perennial: spike slender, tapering at apex: bristles 1 or sometimes 2, ½–1 in. long; spikelets one-twelfth in. long; first glume one-third to one-half, second two-thirds to three-fourths as long as, and third glume equaling the spikelet; first glume inflated about the base of the spikelet. Texas to S. America.

mágna, Griseb. A coarse stout grass resembling Common Millet. Spike ½ in. thick, as much as a foot long, tapering above and below: bristles 1–3, scarcely ½ in. long: spikelets one-twelfth in. long, elliptical; first glume one-third as long as, second and third equaling the spikelet; flowering glume smooth. Marshes of Gulf states to Central America.

A. S. HITCHCOCK.

SHAD-BUSH. Consult *Amelanchier.*

SHADDOCK. See *Citrus* and *Pomelo.*

SHADE TREES. See *Trees.*

SHADING. See *Greenhouse*, page 696.

SHAGBARK. See *Hickory.*

SHALLOT is *Allium Ascalonicum*, Linn., native of Syria. It is grown chiefly for the small oblong-pointed gray bulbs, which are used in cookery for flavoring; the leaves are sometimes eaten in a green state. The bulbs are of mild flavor. Shallots are little known in North America. They are grown as garlics are (see *Garlic*), the bulbs or cloves being separated and planted early in spring in any good garden soil. Each bulb produces several, all cohering by the base. The mature bulbs are 2 in. or less long and only about half that in diameter. The leaves are small, terete and hollow. The plant is hardy. The bulbs will keep several months or even a year. Small onions are sometimes sold as Shallots.

L. H. B.

SHAMROCK. Half the world is sure that Shamrock is the wood sorrel, *Oxalis Acetosella*. The other half is equally certain that the true Shamrock is white clover, *Trifolium repens*. In the time of Spenser's Fairy Queen, Shamrock was said to be good to eat. This applies to the former plant, but not to the latter. Moreover, according to Sowerby, the wood-sorrel is in perfection on Saint Patrick's Day, while white clover is not. The wood-sorrel is sent in great quantities from Ireland to London for Saint Patrick's day. On the other hand, it is said that clover is the plant most commonly used in Ireland. Half a dozen other plants have their followers, and these are all plants with three leaflets. Nevertheless there are those who deny that Saint Patrick used the Shamrock as a symbol of the trinity. These declare that the water cress is the true Shamrock. The question will always remain an open one. See Dyer's "Folk-Lore of Plants." W. M.

SHAMROCK, INDIAN. A name found in some English books for the *Trillium*.

SHAMROCK PEA. *Parochetus communis*.

SHAW, HENRY, founder of the Missouri Botanical Garden, popularly known as "Shaw's Gardens," was born at Sheffield, England, July 24, 1800, and died at St. Louis, Mo., August 25, 1889. He came to the United States in 1819 and engaged in the hardware business until 1840 in St. Louis, where he continued to reside until his death. After retirement from active business he traveled for a number of years, and in 1849 laid out a modest garden about his country house in the suburbs of St. Louis, which, nine years later, he extended so as to include some forty-five acres, about half of this area constituting an arboretum.

By special act of the General Assembly of the state of Missouri, approved in March, 1859, Mr. Shaw was empowered to provide for the conveyance of his property, either during his life or after his demise, to trustees, for the perpetual maintenance of his garden as a scientific establishment. In 1885 he endowed a department in Washington University, known as the Henry Shaw School of Botany, and on his death left nearly all of his property, valued at some $5,000,000, to a board of trustees for the maintenance, improvement and enlargement of the Missouri Botanical Garden.

Mr. Shaw, though not a botanist, was a lover of plants for themselves and a firm believer in their influence in molding desirable traits in human character. His garden was always open to visitors, among whom he particularly welcomed the self-respecting poor. Thirty years before his death he gave to the city of St. Louis a park site adjacent to his garden, which, like the latter, was improved under his personal supervision.

Special provisions in Mr. Shaw's will, aside from the general arrangements for the development of the garden —in details of which he allows his trustees a very free hand—are for an annual sermon "on the wisdom and goodness of God as shown in the growth of flowers, fruits, and other products of the vegetable kingdom;" premiums for an annual flower show; and two annual banquets, respectively for the trustees and gardeners of the institution. These banquets are the occasion for annual gatherings of men distinguished in botany and horticulture. WM. TRELEASE.

SHEEP BERRY. *Viburnum Lentago*.

SHEEP'S BIT. *Jasione perennis*.

SHELLBARK. See *Hicoria* and *Hickory*.

SHELL-FLOWER. See *Cyclobothra;* also *Alpinia nutans;* also *Moluccella lævis*.

SHELL-LILY is *Alpinia nutans*.

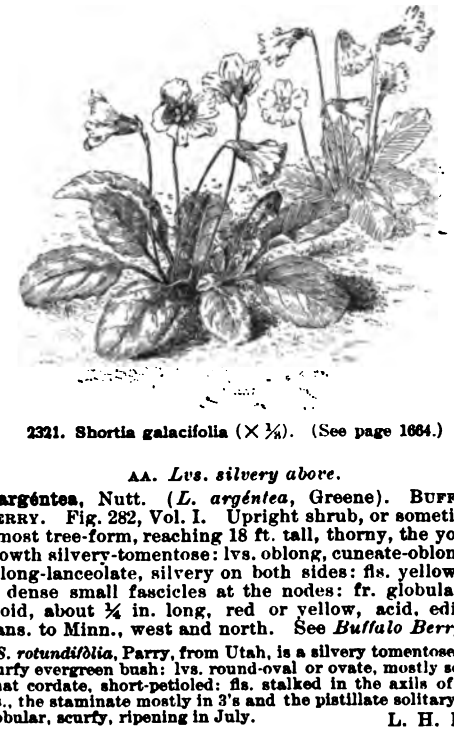
SHEPHÉRDIA (John Shepherd, an English botanist). *Elæagnaceæ*. Three American shrubs with silvery or brown-scurfy foliage, two of which are in the trade, being grown for their striking appearance and one of them prized for its edible fruit. The leaves are opposite, petioled, entire. Flowers diœcious or polygamous and apetalous, small and inconspicuous, borne in small sessile or nearly sessile clusters; calyx 4-parted; stamens 8, alternating with 8 lobes of a disk; pistil 1, nearly inclosed by the disk at the orifice of the calyx-tube, becoming a nut or akene and invested by the fleshy calyx, forming a drupe-like fruit. In *S. argentea*, the Buffalo Berry, the fruit is edible when made into jellies and conserves, and is much prized in the upper Plains region for household uses.

The Shepherdias are hardy plants, withstanding extremes of cold and drought. They are of easy culture, and grow readily from stratified seeds. For ornamental planting, they are prized for bold positions in front of shrubbery masses, where their gray or white colors afford excellent contrasts. *S. Canadensis* is particularly well adapted for planting on dry, rocky, sterile banks, where most bushes find great difficulty in securing a foothold. *S. argentea* succeeds better in the upper Mississippi valley than in the eastern states. Staminate and pistillate plants of it have different forms of buds.

The genus Shepherdia was founded by Nuttall in 1818. It is said that Rafinesque's Lepargyræa, 1817, is equivalent, and the species have been placed under the latter name by recent writers.

A. *Lvs. green above.*

Canadénsis, Nutt. (*Lepargyræa Canadénsis*, Greene). Spreading twiggy bush 3 to 6 or even 8 ft. tall, the young branches brown-scurfy: lvs. ovate, oval or elliptic, rather thick, green above but rusty beneath: fls. yellowish, in short clusters at the nodes: fr. small (¼ in. or less long), oval, red or yellow, insipid. Along streams and on lake banks, Newfoundland to British Columbia and in the northern tier of states, and southward in the mountains to Utah.—Little known in cult., but has been offered by dealers in native plants.



2321. Shortia galacifolia (× ⅛). (See page 1664.)

AA. *Lvs. silvery above.*

argéntea, Nutt. (*L. argéntea*, Greene). BUFFALO BERRY. Fig. 282, Vol. I. Upright shrub, or sometimes almost tree-form, reaching 18 ft. tall, thorny, the young growth silvery-tomentose: lvs. oblong, cuneate-oblong or oblong-lanceolate, silvery on both sides: fls. yellowish, in dense small fascicles at the nodes: fr. globular or ovoid, about ¼ in. long, red or yellow, acid, edible. Kans. to Minn., west and north. See *Buffalo Berry*.

S. rotundifòlia, Parry, from Utah, is a silvery tomentose and scurfy evergreen bush: lvs. round-oval or ovate, mostly somewhat cordate, short-petioled: fls. stalked in the axils of the lvs., the staminate mostly in 3's and the pistillate solitary: fr. globular, scurfy, ripening in July. L. H. B.

SHEPHERD'S CLUB or MULLEIN is *Verbascum Thapsus*.

SHINLEAF. *Pyrola*.

SHOEBLACK PLANT. *Hibiscus Rosa-Sinensis*.

SHOO-FLY PLANT. A name proposed by one seedsman for Physalis.

SHOOTING STAR. See *Dodecatheon*.

SHORE-GRAPE. See *Coccoloba*.

SHÓRTIA (named for Dr. Charles W. Short, a botanist of Kentucky). *Diapensiàceæ*. Of the little family Diapensiaceæ, with its 6 genera and 8 species, *Shortia galacifolia* is historically the most interesting. Michaux collected the plant in 1788 in the high mountains of Carolina, but as his specimen was in fruit rather than in flower, Richard, the author of Michaux's "Flora Boreali-Americana," did not describe it. Asa Gray examined Michaux's specimen, preserved in Paris, in 1839, and afterwards founded the genus Shortia on it. Great search was made for the plant in the mountains of Carolina, but it was not rediscovered until 1877. The history of the efforts to find the plant is one of the most interesting chapters in American botany. For historical sketch, see Sargent, "Garden and Forest," vol. 1, p. 506 (1888).

2322. Every part of the place is equally accented.

Torrey & Gray founded the genus Shortia in 1842. In 1843 Siebold & Zuccarini founded the genus Schizocodon, from Japan. To this genus Maximowicz added a second Japanese species, *S. uniflorus;* the flowers of this plant, as of Shortia, were unknown when the plant was first recognized. It transpires, however, that *Schizocodon uniflorus* is really a Shortia, thus adding another instance to the growing list of bitypic genera that are endemic to Japan and eastern North America.

Shortia includes two acaulescent herbs, with the habit of Galax, with creeping rootstocks and evergreen round-cordate lvs.: fl. solitary on a slender leafless scape, the calyx with scaly bracts, the corolla bell-shaped and obtusely 5-lobed; stamens 5, the filaments adnate to the corolla, alternating with 5 scale-like staminodia; pistil 3-angled and 3-loculed; style filiform and stigma 3-lobed: fr. a globular capsule. From this, Schizocodon is distinguished by linear-elongated staminodia and fringed corolla. Allied genera mentioned in this Cyclopedia are Galax, Pyxidanthera and Schizocodon. Diapensia has two alpine and boreal species, one in the Himalayas and the other in northern Europe and North America. Berneuxia, the remaining genus, has a single species in Thibet. Diapensia and Berneuxia are not in the American trade. *Shortia Californica* of seedsmen will be found under *Actinolepis*.

galacifòlia, Torr. & Gray. Fig. 2321. Lvs. all radical, long-petioled, the blades orbicular or broadly ovate-orbicular, often slightly cordate, at the apex obtuse or even retuse, the margin repand-serrate: peduncles slender, 3–8 in. tall, 1-fld., bracted near the top: fl. inclined or nodding, white, 1 in. across, the obtuse lobes undulate. Mts. of N. Car. B.M. 7082. G.C. II. 15:596; III. 5:397; III. 17:453. Gn. 38:768. J.H. III. 30:299. G.M. 34:353. G.W.F. 24. G.F. 1:509. A.G. 12:287. Mn. 6, p. 83.—A very attractive plant with the look of a Pyrola; very local. On the culture of *Shortia galacifolia*, Harlan P. Kelsey writes as follows: "Shortia, like most plants considered rare, is really not so rare as local, though the few stations where it is found abundantly do not seem to present special conditions not to be found elsewhere, and it is hardly understood why it should, in common with certain other plants, have remained strictly local, in an indigenous state. For the successful culture of Shortia humus and leaf-mold seem to be absolutely required, and it should either be planted where these conditions are natural or be constantly supplied with this food if not. This suggestion, if carried out with many plants, such as Galax, Pyrola, Chimaphila and probably *Epigæa repens*, will ensure success, where if ordinary garden treatment only is given the entire disappearance of the plants may be expected in a season or two. Semi-double and pink-flowering plants are not rarely found, and it seems likely that cultivation may bring out several worthy varieties. In England Shortia is often grown successfully as a pot-plant, and is far more appreciated than in America. It is difficult to procure seed, as the flowering stem usually withers away before maturing, though Shortia is readily propagated by division and runners. It is a shade-loving plant and is a choice addition to the ericaceous bed, where it will thrive under Rhododendrons and Kalmias."

uniflòra, Maxim. Very like *S. galacifolia:* lvs. cordate, broader than long and deeper toothed,—sinuate-toothed in *S. uniflora* and only repand-toothed in *S galacifolia*. Japan.—Offered by importers of Japanese plants, but little known horticulturally. L. H. B.

SHOT, INDIAN. See *Canna*.

SHOWER OF GOLD. Catalogue name for *Genista*.

SHRUBBERY. Shrubs and bushes have two values: an intrinsic value as individual or isolated specimens; a value as part of the structure or design of an ornamented place. As individual specimens, they are grown for the beauty of the species itself; as parts of the landscape, they are often grown in masses, constituting a shrubbery. It is often advisable to plant shrubs as single specimens, in order to produce the characteristic beauty of the species; but the tendency is to plant exclusively as isolated specimens, and the emphasis needs, therefore, to be placed on mass-planting.

Plants scattered over a lawn destroy all appearance of unity and purpose in the place (Fig. 2322). Every part of the place is equally accented. The area has no meaning or individuality. The plants are in the way. They spoil the lawn. The place is random. If the shrubs are sheared, the spotted and scattered effect is intensified. Rarely does a sheared shrub have any excuse for existence.

?

A mass of planting emphasizes particular parts of the place. It allows of bold and broad contrasts. It may give the place a feeling of strength and purposiveness. The shrubbery-mass usually should have an irregular outline and generally contain more than one species. Thereby are variety and interest increased. Fig. 2323. The shrubbery-masses should be placed on the boundaries; for it is a fundamental concept of landscape gardening that the center of the place shall be open. Fig. 2324; also Fig. 1233, Vol. II. The boundaries are the lines between properties, the foundations of buildings, the borders along walks and drives. Judicious planting may relieve the angularity of foundations and round off the corners of the yard. Fig. 2325. Individual specimens may be used freely, but only rarely should they be wholly isolated or scattered. They should be planted somewhere near the borders, that they may not interfere with the continuity of the place and that they may have background to set them off. The background may be a building, a bank, or a mass of foliage. In most places, the mass or border-planting should be the rule and the isolated specimen the exception; but, unfortunately, this rule is usually reversed. It is not to be understood, however, that boundaries are always to be planted or that foundations are always to be covered.

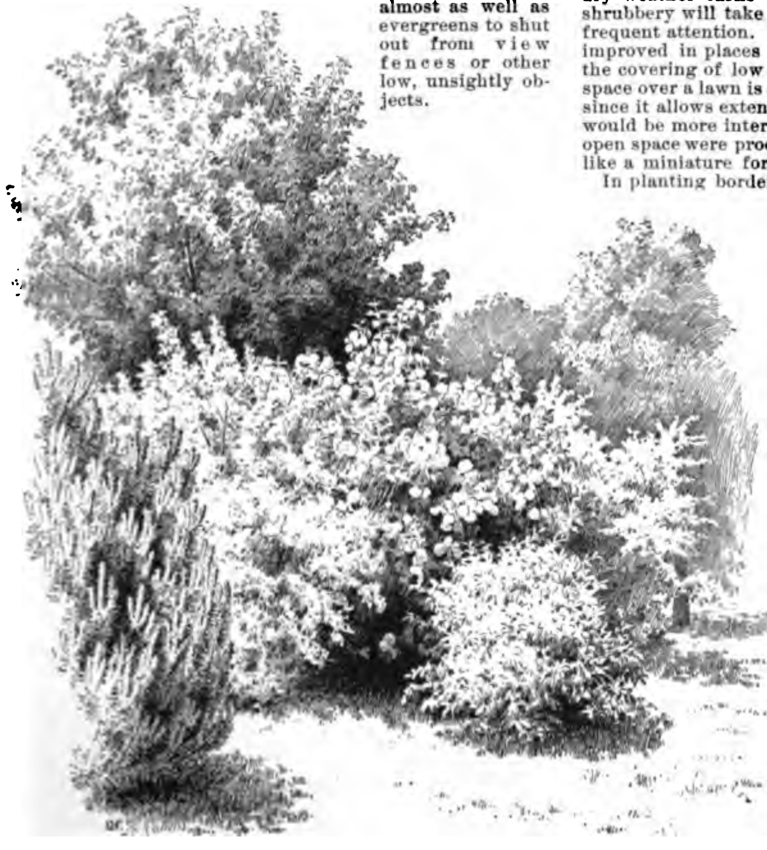
L. H. B.

The term shrubbery is applied to groups of woody plants of comparatively small size. The line between shrubs and trees is not very definite. A shrub gener-

Plate XXXVII. A colony of Snowballs, well placed. To illustrate the article "Shrubbery."

ally has a number of stems springing from the ground and a tree usually has a single trunk, but this is not uniformly true in either case.

The chief value of shrubbery comes from its use in an artistic way, although some shrubs have edible fruits. Many shrubs, such as lilacs, some of the spireas, gooseberries and currants, produce leaves very early in the season and some, like Forsythia, Daphne, and the Juneberry are covered with a profusion of blossoms at this time. From early spring until November in temperate latitudes leaves and flowers are to be found on deciduous shrubs, and from June until the following spring ornamental fruits can be seen on their branches, the red berries of the elder beginning and barberries ending the list. Some of these fruits are so richly colored and so abundant that they can be seen from a long distance. Many shrubs, like some of the viburnums and dogwoods, attain a height of 10 or 15 feet, while others, like bunchberry and *Daphne Cneorum*, grow to a height of only a few inches. The leaves of some, like the chokeberry, Thunberg's barberry, the hazels, viburnums, dogwoods, and sumachs are beautifully colored in the fall. The rhododendrons, laurels (Fig. 2326) and mahonias, and the daphne already named, are examples of shrubs having evergreen foliage. Some leaves, like those of the *Salix lucida*, are glossy; others, as those of the common hazel, are hairy; some are thick, and others are thin; some large, some small; some entire, and some lobed, serrated or compound. Throughout the season the foliage of a good collection of shrubbery will present the greatest variety of color, including all the hundreds of shades of green as well as yellow, white, gray and purple. Even in winter shrubbery is wonderfully attractive in appearance from the gracefulness of its stems and branches, and from the color of its bark. With the right selections, it will serve almost as well as evergreens to shut out from view fences or other low, unsightly objects.



2323. Variety and interest are increased.

2324. The Shrubbery-masses usually should be placed on the boundaries.

This great variety in foliage, flower, fruit and habit of growth makes shrubbery adapted to very extended use in the development of landscapes. It is especially appropriate along the boundaries of ornamental grounds (Fig. 2324), upon steep slopes, and in the immediate vicinity of buildings where foliage and graceful lines are needed to connect the walls of a structure with the ground (Fig. 2325), without making too much shade. It might with advantage replace the grass upon all surfaces too steep to walk upon with comfort. The foliage of shrubs that are well established remains green when dry weather turns grass brown. The broad mass of shrubbery will take care of itself when the grass needs frequent attention. Even some level surfaces might be improved in places by exchanging a lawn covering for the covering of low woody plants. Often a broad, open space over a lawn is an important feature of a landscape, since it allows extended views. Many times a landscape would be more interesting if the green underneath this open space were produced by a broad mass of shrubbery like a miniature forest instead of grass.

In planting borders or groups of shrubs, the ground to be occupied by such a group should be entirely spaded over or plowed. Perhaps no better advice could be given than to prepare the soil as it should be prepared for a field of corn. The bushes should then be planted so that there is room for about two years' growth before their branches intermingle. If placed closer they would have a crowded appearance from the start and would not join their branches as harmoniously as when the new growth is allowed to choose its own position. If placed farther apart the effect is also bad. Occasionally a single shrub at the margin of a belt may stand out almost by itself, but generally the effect of a group should be that of a continuous mass of varying foliage. In arranging different shrubs the taller-growing kinds should generally be placed in the center of the group, and the lower species along the border, the space being graded from the highest to the lowest. The reason for this arrangement is that the lower plants would be killed by the shade of the larger ones if placed back of them, and moreover would not be seen; but one should avoid too uniform a slope. For instance, in a continuous border there should be places where shrubs of larger size occupy the full width so as to bring growth of considerable height into the lawn. The arrangement should be varied so as to avoid all monotony, but in securing this variation a mixture of miscellaneous shrubs of all kinds does not give as good an effect as broader areas of single species or genera slightly interspersed at the margin with shrubs of another kind. Straight rows should be avoided. A laborer or a novice when told this will arrange the plants in a zigzag manner, thinking that he is placing them irregularly, the result often being almost the same as that of two rows. If the group is being planted along a straight line, as the boundary of a lot, the distances of the successive plants from this line might be somewhat as follows: two feet, four feet, five feet, three feet, one foot, and the distances apart, measured parallel with a fixed line, should vary also.

2325. Planting may relieve the angularity of foundations.—A billow of trumpet creeper.

The ideal condition of a group of shrubbery is to have all the individual plants healthy, so that the foliage will appear fresh and of good color. This foliage should extend down to the surface of the adjacent lawn or walk, and shade the ground underneath so completely that nothing will grow there. The leaves which fall with the approach of winter should be allowed to remain as a perpetual mulch. The desired result cannot be secured the first year the shrubs are planted unless they are of large size and moved but a short distance. The aim in caring for a new plantation should be to secure thrifty plants, and this care, like the preparation of the soil, should be such as is given to a field of corn.

Very little trimming should be done. If a bush is tall and spindling it may be well to cut it off next to the ground and allow it to sprout again. If there is any dead wood it should, of course, be cut off. But when a shrub is healthy and vigorous, let it grow in its own graceful way. If it encroaches upon the walk, cut away the encroaching branch near the root so that the mark of the knife will not be noticed. Such treatment will help to retain the winter beauty of the branches.

The value of shrubbery is not appreciated as it should be. Those who are interested in the subject will do well to read what is found in the various books on landscape gardening, Bulletin No. 121 of Cornell University Agricultural Experiment Station, the various articles on shrubs and shrubbery to be found in the ten volumes of "Garden and Forest" and in other horticultural journals.

O. C. Simonds.

SIBBÁLDIA (Robert Sibbald, Scotch naturalist). *Rosàceæ.* About 5 species of alpine plants, one of which has been suggested as suitable for rock gardens. The genus is reduced by Bentham and Hooker to a section of Potentilla, but Britton and Brown keep it separate chiefly on the ground that the pistils are only 4–12 in number instead of very numerous as in Potentilla. Sibbaldias are densely tufted, hardy perennial herbs with woody stems. The lvs. have prominent stipules and 3 leaflets, each of which is characteristically 3-toothed at the apex. The fls. are about ¼ in. across or less, and have 5 minute yellow petals much smaller than the remarkable calyx, which has 5 broad lobes, alternating with 5 smaller and narrower lobes or bracts.

procúmbens, Linn., ranges from the arctic regions to the summits of the White Mts. and in the Rockies comes as far south as Utah. It is also found in arctic and alpine Europe and Asia. B. B. 2:217.—This plant is recommended by some persons, but is not known to be advertised for sale in America.

W. M.

SIBTHÓRPIA (John Sibthorp, professor of botany at Oxford, author of Flora Græca, published 1806–15). *Scrophulariàceæ.* A genus of about 6 species of hardy or tender perennial, creeping herbs mostly from the tropical regions, with alternate or tufted roundish, long-petioled lvs. and yellow, orange, or red fls. solitary on axillary or fascicled pedicels: calyx 4–5-cleft; corolla subrotate, with a very short tube, 5–8-cleft; stamens usually equal to the number of corolla-lobes; anthers sagittate: capsule membranous, compressed, loculicidally dehiscent, the valves splitting to the middle.

Europæa, Linn. A hardy trailing perennial with very slender stems: lvs. orbicular, less than ½ in. across, 7–9-lobed: fls. small, on rather short pedicels, the 2 upper lobes of the corolla yellowish, the 3 lower pink. Deep woods, Europe.—Offered in 1893 by John Saul, Washington, D.C. Var. **variegàta** is cult. abroad.

F. W. Barclay.

SICÀNA (Peruvian name). *Cucurbitàceæ.* Two or 3 species of tropical American tall-climbing tendril-bearing vines, allied to Cucurbita, but differing in having wide-spreading or reflexed calyx-lobes and the anthers not united. **S. odorifera,** Naud., the Curuba of the tropics, has been introduced as the Cassabanana, but long known in the South. Fig. 2327. It is a very quick-growing and interesting ornamental vine: plant gla-

2326. The common laurel of the East, Kalmia latifolia (× ¼).

brous, the stems angled: lvs. large (often 1 ft. across), nearly orbicular in outline, deeply cordate at the base, strongly about 5-lobed and the lobes repand-toothed or angled: fls. solitary, monœcious, the corolla small and yellowish, urn-shaped, with small reflexed lobes; stigmas 3, each 2-lobed: fr. like a slender vegetable marrow, 1–2 ft. long, smooth, nearly cylindrical, orange-crimson, with a very strong aromatic odor. R.H. 1890:516.—Probably native to Brazil, but occurring also in Mex. and the West Indies. The Curuba seems to be grown in the tropics as an ornamental plant, although it is said to afford edible preserves. The plant climbs 30–50 ft. It is well worth growing on summer arbors, or under glass if one has room for it. The fruits are very interesting, fragrant and ornamental. Perennial.

S. atropurpùrea, André. Has shorter subpyriform, brilliant violet-purple fruits, and purple-tinted under surfaces of the lvs. Perhaps a form of S. odorifera. Uruguay. R.H. 1894:108.—*S. sphérica*, Hook. f. Fls. large and spreading, more like those of Cucurbita: lvs. reniform, 3–5-lobed: fr. globose, size of a small orange. Jamaica. B.M. 7109. L. H. B.

SÌDA (from the old Greek name for *Nymphæa alba;* given without explanation by Linnæus). *Malvàceæ.* A genus of about 80 species of herbs or shrubs, mostly native of the tropical regions of the world, with usually serrate, dentate or lobed leaves and small or rarely large, mostly yellow or whitish flowers, which are solitary or in clusters, axillary or disposed in terminal branching spikes or heads; bracteoles wanting or rarely 1–2 and bristle-like: calyx 5-dentate or 5-cleft; staminal column divided at apex into many filaments: locules of ovary 5 or more, 1-seeded.

A. *Lvs. large, lobed.*

Napæa, Cav. A hardy herbaceous perennial 5–8 ft. high, from a stout root: lvs. 3–8 in. long, 3–7-lobed; lobes triangular, long-acuminate, irregularly serrate: fls. perfect, white, about 1 in. across, in terminal corymbose panicles. June–Aug. S. Pa., W. Va. and Va. B.B. 2:422.—Culture same as for hollyhocks; prop. by seed. Index Kewensis refers the above species to *Napæa dioica*, Linn., but according to Gray's Synoptical Flora of North America the two species belong to separate genera, the fls. of the first being hermaphrodite, of the second diœcious. *Napæa dioica* is a strong-growing perennial 5–9 ft. high, with large radical lvs. often 1 ft. across and 9–11-cleft, the segments cut into lanceolate, serrate lobes: fls. diœcious, white, smaller than in *Sida Napæa*. For pictures of the two plants, see B.B. 2:420, 422.

AA. *Lvs. small, linear.*

Élliottii, Torr. & Gray. A hardy perennial herb, slender, 1–3 ft. high, with lvs. 1 in. long and yellow fls. Sandy soil in the southern coast states. Offered by western collectors in 1881. F. W. Barclay.

SIDÁLCEA (compound of *Sida* and *Alcea*, related genera). *Malvàceæ.* About 20 herbs of western North America: lvs. palmately cleft or parted, stipular: fls often showy, pink, purple or white, in terminal racemes or spikes, mostly without bracts or involucels beneath; stamens united into groups in a double series; carpels 5–9, reniform, separating at maturity. Some of the Sidalceas are annuals, but those in cultivation are hardy perennials, being recommended for the herbaceous border. Of easy culture. Prop. by seeds or division. For monograph, see Gray, Syn. Fl. N. Amer., vol. 1, p. 302.

A. *Fls. white, with bluish anthers.*

cándida, Gray. Plant erect, from more or less creeping rootstocks, the stems somewhat branched above, 2–3 ft. tall, glabrous or nearly so: radical lvs. nearly orbicular, cordate, obtusely lobed or deeply crenate; stem-lvs. 5–7-parted, the divisions narrow and often notched: fls. 1 in. or more across, white, in an erect spike-like raceme. Rocky Mts. Gn. 24, p. 396; 28, p. 29. R.H. 1891, p. 356.

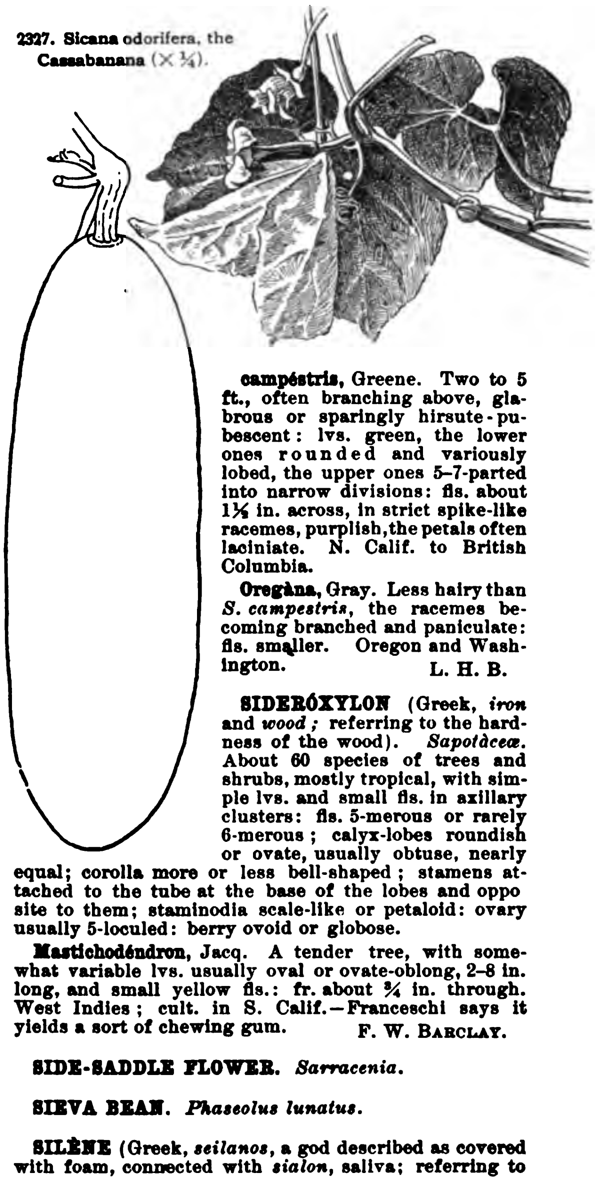
AA. *Fls. normally colored (rarely white forms).*

B. *Mature carpels smooth (not reticulated).*

spicàta, Greene. One or two feet tall, sparingly branched or simple, often more or less hirsute: upper lvs. parted into linear and often lobed divisions: fls. rather small, purplish, in an oblong, more or less interrupted spike, the pedicels short or almost none. California, Nevada and Oregon.

BB. *Mature carpels conspicuously reticulated.*

malvæflòra, Gray. Stems erect or ascending, 1–6 ft. or even more, sparingly hirsute: lvs. green, small, incised-crenate, the upper ones 5-cleft or 5-divided, segments narrow and entire or broader and pinnate-lobed: fls. 2 in. or less across when fully expanded, purple. Calif.—Var. **Listeri**, Hort. (*S. Lìsteri*, Hort.), known also as "Pink Beauty," has satiny pink flowers. It is of European origin.


2327. Sicana odorifera, the Cassabanana (× ¼).

campéstris, Greene. Two to 5 ft., often branching above, glabrous or sparingly hirsute-pubescent: lvs. green, the lower ones rounded and variously lobed, the upper ones 5–7-parted into narrow divisions: fls. about 1½ in. across, in strict spike-like racemes, purplish, the petals often laciniate. N. Calif. to British Columbia.

Oregàna, Gray. Less hairy than *S. campestris*, the racemes becoming branched and paniculate: fls. smaller. Oregon and Washington. L. H. B.

SIDERÓXYLON (Greek, *iron* and *wood;* referring to the hardness of the wood). *Sapotàceæ.* About 60 species of trees and shrubs, mostly tropical, with simple lvs. and small fls. in axillary clusters: fls. 5-merous or rarely 6-merous; calyx-lobes roundish or ovate, usually obtuse, nearly equal; corolla more or less bell-shaped; stamens attached to the tube at the base of the lobes and opposite to them; staminodia scale-like or petaloid: ovary usually 5-loculed: berry ovoid or globose.

Mastichodéndron, Jacq. A tender tree, with somewhat variable lvs. usually oval or ovate-oblong, 2–8 in. long, and small yellow fls.: fr. about ¾ in. through. West Indies; cult. in S. Calif.—Franceschi says it yields a sort of chewing gum. F. W. Barclay.

SIDE-SADDLE FLOWER. *Sarracenia.*

SIEVA BEAN. *Phaseolus lunatus.*

SILÈNE (Greek, *seilanos*, a god described as covered with foam, connected with *sialon*, saliva; referring to the stickiness of stem and calyx). Catchfly. Campion. *Caryophyllàceæ.* A large and scattered genus of herbs, varying greatly in duration, habit and style of inflorescence, but always with 5-petaled fls. ranging in color from white, through pink and rose to purple. The petals are notched at the apex, rarely toothed or fringed and generally have small tooth-like appendages at the base of the blade. The calyx is sometimes inflated like a bladder, generally 10-nerved, sometimes 20-nerved: ovary 1-loculed, many-ovuled; styles commonly 3: capsule dehiscing at the apex into 6 (rarely 3) teeth or short valves. There is a full botanical monograph of Silene, with a key, in the Journal of the Linnean Society, vol. 32 (1896), by F. N. Williams, a specialist on the whole family of Caryophyllaceæ. The account is mostly in Latin, and has few descriptions. Williams admits 390 good species. His revision has not been closely followed below. Williams refers our common *S. Virginica* and *Pennsylvanica* as well as the European *S. viscosa* to the genus Melyandrum, characterized by a strictly unicellular capsule with no trace of septation at the base. Only a few of the known species are in cultivation.

Silenes are of easy culture. They mostly bloom in summer, and a few continue well into autumn. By good management the season of bloom may be continued through spring and summer. Toward this end the seeds of the common annual kinds should be sown in early autumn, instead of spring. As a rule, the common kinds prefer a sandy loam and full sunlight, but the rock-garden kinds require special treatment, and other suggestions for cultivation are given after the specific descriptions. The most popular kinds are the pink and rose annuals, *S. Armeria* and *pendula*. Of the perennials the most popular among the white-fld. kinds are *S. maritima* and *alpestris*, while *S. Virginica*, *Pennsylvanica* and *Schafta* are amongst the most popular kinds with colored flowers. A good horticultural review of the kinds in cultivation is found in The Garden, Vol. 11, pp. 10–13 (1877).

INDEX.

acaulis, 7.
alba, 3.
alpestris, 11.
Armeria, 3.
Californica, 17.
Caucasica, 9.
compacta, 1, 4.
Cucubalus, 14.
Douglasii, 19.
inflata, 14.
Lyalli, 19.
Macounii, 19.
maritima, 6.
Menziesii, 18.
pendula, 1.
Pennsylvanica, 13.
petræa, 8.
plena, 2, 6.
Pumilio, 5.
rosea, 6.
ruberrima, 1.
Schafta, 12.
Scouleri, 20.
stellata, 15.
vallesia, 10.
Virginica, 16.
viscosa, 2.

A. *Duration annual or biennial.*
B. *Petals notched at apex.*
C. *Plants low and trailing* ..... 1. **pendula**
CC. *Plants erect, 1–1½ ft. high.*
D. *Calyx sticky-hairy*........ 2. **viscosa**
DD. *Calyx glabrous*............ 3. **Armeria**
BB. *Petals entire at apex* .... 4. **compacta**
AA. *Duration perennial.*
B. *Height a few inches.*
C. *Stems 1-fld. or few-fld.*
D. *Calyx 20-nerved, inflated after anthesis.*
E. *Fls. rose* .... 5. **Pumilio**
EE. *Fls. white*.............. 6. **maritima**
DD. *Calyx 10-nerved, not bladder-like after anthesis.*
E. *Lvs. linear.*
F. *Calyx bell-shaped*.... 7. **acaulis**
FF. *Calyx club-shaped*.... 8. **petræa**
EE. *Lvs. oblong or lanceolate.*
F. *Plant velvety* .... 9. **Caucasica**
FF. *Plant glandular* ......10. **vallesia**
CC. *Stems many-fld.*
D. *Petals 4-lobed*.............11. **alpestris**
DD. *Petals 2-lobed.*
E. *Fls. erect*................12. **Schafta**
EE. *Fls. nodding*...........13. **Pennsylvanica**
BB. *Height a foot or more.*
C. *Calyx inflated after anthesis*.14. **inflata**
CC. *Calyx not inflated after anthesis.*
D. *Petals laciniate or fringed*.15. **stellata**
DD. *Petals not laciniate.*
E. *Fls. crimson, scarlet or deep red.*
F. *Apex of petals sharply 2-toothed*............16. **Virginica**
FF. *Apex of petals various*.17. **Californica**
EE. *Fls. white to pink.*
F. *Inflorescence leafy: fls. borne in forks of branches*............18. **Menziesii**
FF. *Inflorescence composed of long-peduncled cymes* ....19. **Douglasii**
FFF. *Inflorescence denser, vertically spicate* ...20. **Scouleri**

1. **péndula**, Linn. Trailing, branched annual, with flesh-colored or rosy fls. which become pendulous when their beauty is past: plant pubescent: lvs. lanceolate: fls. solitary or in pairs in the axils; calyx 10-nerved, not bladder-like after anthesis, but constricted at the apex in fruit; petals emarginate: seeds kidney-shaped. Mediterranean region. B.M. 114.—Var. **rubérrima** is offered; also varieties with single and double rose-colored fls. R.H. 1884, p. 113. Var. **compácta** is offered. Gt. 49, p. 555. A good bedding plant.

2. **viscòsa**, Pers. Biennial, viscous-villous: lvs. undulate: racemes verticillate; peduncles opposite, 1–3-fld.; petals bifid. June, July. Eu., N. Asia.—According to Ellwanger & Barry, var. **plèna** grows 1 ft. high and has bright rose double flowers. Use basal cuttings.

3. **Armèria**, Linn. SWEET WILLIAM. CATCHFLY. Fig. 2328. Annual, 1–1½ ft. high, with many-fld. panicles of pink, rosy or white fls.: glabrous except for the wide sticky bands below the nodes at the top of plant: lvs. ovate: fls. borne in corymbose panicles; calyx tubular-club-shaped, 10-nerved; petals emarginate, appendaged. Southern Europe.—Var. **álba**, Hort., is also popular.

4. **compácta**, Fisch. Much like *S. Armeria* but biennial, with more compact inflorescence, longer fls., petals acute and entire at apex, and a more easterly geographical range. E. Eu., Asia Minor. L.B.C. 17:1638. —*S. compacta* of some tradesmen is likely to be a compact-growing variety of *S. pendula*.

5. **Pumílio**, Wulf. PIGMY CATCHFLY. Dwarf perennial, with linear lvs. and solitary, rose-colored fls.: height a few inches: calyx faintly 20-nerved, inflated after anthesis, wholly green or wholly "chocolate-crimson"; petals "undivided," according to Williams, but prettily wavy-lobed in Gn. 11:55. Austrian Alps.—A rare and choice plant. Niven says it has hard woody roots which are easily damaged in transit, and therefore those who wish the species should secure seeds. Woolson advises a sunny position and rich sandy soil.

6. **marítima**, With. SEASIDE CATCHFLY. Trailing perennial, with numerous white fls. borne on few-fld. stems. It has larger fls. than *S. inflata*, with fewer fls. on a stem. and the petals not so deeply cut at the apex, and 2 small scales at the base of each petal: lvs. various: calyx 20-nerved, inflated after anthesis. Eu. Gn. 57, p. 372.—The seaside plants are said to be more glaucous than those from the Alps. Var. **ròsea**, Niven, is said to have a less rambling habit and rose-colored fls. Origin unknown. This desirable form seems unknown in America. Var. **plèna**, Hort., has fewer fls. than the type but they are much larger, extremely double and remain in bloom longer. Niven says, "This variety makes a lovely rock plant, and ought always to be placed in such a position that its stems, borne down by the weight of blossoms, may hang over the ledge of a rock; otherwise, if planted in a border, they get besprinkled with soil after every shower of rain." Niven adds that this variety produces no seed and is more easily propagated by cuttings than by division. Gn. 11, p. 12; 57, p. 126.

7. **acaùlis**, Linn. CUSHION PINK. MOSS CAMPION. Moss-like, tufted perennial about 2 in. high, with reddish purple fls. about ½ in. across, borne one on a stem. Rootstock much branched: branches short, covered with remains of old lvs. and crowned by dense, spreading clusters of short, green linear lvs., from the center of which arise the fl.-stalks: calyx campanulate, glabrous; teeth obtuse; petals obovate, slightly notched, with a small scale at the base of the blade. May–Aug. L.B.C. 6:568.—According to Niven, this species is readily increased by division or by seeds, which it produces sparingly. The fls. have a tendency to become diœcious. There is a white variety with somewhat smaller fls.

8. **petræa,** Walldst. & Kit. Tufted subshrub, 4 in. high: lvs. linear: fls. small, solitary; calyx club-shaped; petals bifid, with a bifid appendage, and ciliate on the claw. Caucasus.—Fls. white, according to J. Woodward Manning.

9. **Caucásica,** Boiss. This and *S. Vallesia* are perennial, alpine, white-fld. plants 4–5 in. high, with the flowering stems laterally ascending from a terminal rosette of lvs.: the stems are usually 1-fld., sometimes 2–3-fld.: lvs. oblong or lanceolate: calyx 10-nerved, not inflated after anthesis. Caucasus. For distinctions from *S. Vallesia*, see that species.

10. **vallèsia,** Linn. Swiss Catchfly. A very rare plant found in the highest and most sterile parts of the Alps, differing from *S. Caucasica* in being glandular, rather than velvety, the stem-lvs. long, the fls. long-peduncled and the calyx more widely inflated.

11. **alpéstris,** Jacq. Alpine Catchfly. Perennial white-fld. plant 6 in. high, the fls. borne in panicles: stems tufted, dichotomous: fls. in corymbose panicles; calyx short, top-shaped to bell-shaped, 10-nerved, not enlarged after anthesis; petals 4-lobed at apex and provided with 2 teeth at the base of each petal in the throat: seed cristate-ciliate on the margin. Eastern Eu.—It forms a dense mass of underground stems and is easily prop. by division or seeds. One of the best.

12. **Schâfta,** G. Gmel. Autumn Catchfly. Woody-rooted perennial 6 in. high, with rosy fls. borne on stems which arise laterally from the rosettes of lvs.: lvs. obovate: fls erect; calyx 10-nerved, not inflated after anthesis; petals wedge-shaped, notched, bearing 2 scales at the base in the throat. June–Oct. Caucasus. B.R. 32:20 (fls. "purple"). F.S. 3, p. 286 C.

2328. **Silene Armeria** (× ½).

13. **Pennsylvánica,** Michx. Wild Pink. Perennial, 6–9 in. high, from a strong taproot and with rose or white fls. in small, dense terminal cymes, viscid-pubescent: lvs. mostly at the base, spatulate or oblanceolate, the 2 or 3 pairs of stem-lvs. much shorter and lanceolate: petals appendaged, 2-lobed, the lobes dentate. April, May. Eastern U. S. B.R. 3:247. L.B.C. 1:41 (as *S. incarnata*).—Handsome.

14. **inflàta,** Sm. (*S. Cucùbalus*, Wibel). Bladder Campion. Bladder Catchfly. Cow Bell. White Ben. Perennial, 2–3 ft. high, with many-fld. panicles of white, drooping fls. about ¾ in. across: plant branched, glabrous, glaucous or downy: lvs. ovate, obovate or oblong: calyx 20-nerved, inflated after anthesis; petals deeply cleft. Eu., N. Africa, Himalayas.—This species is not advertised in America but is probably cult. here, possibly as *S. maritima*, of which it is considered by some a variety. *S. inflata* is said to be essentially erect instead of procumbent and the petals more deeply cleft. The young shoots are said to be eaten by the poor folk of England as a substitute for asparagus; they taste something like green peas.

15. **stellàta,** Ait. Starry Campion. Readily told by its fringed white and nodding fls. and lvs. in 4's. Perennial, 2–3 ft. high: lvs. ovate-lanceolate, 2–3 in. long: fls. in an open panicle; calyx inflated; petals laciniate, unappendaged. Woods, Mass. to Neb., south Ga. to Tex. B.M. 1107.

16. **Virgínica,** Linn. Fire Pink. Fig. 2329. Perennial, 1–2 ft. high, with large crimson or scarlet fls., viscid-pubescent: stem unbranched: lvs. spatulate or oblanceolate: fls. 1 in. or more across, loosely cymose, nodding or reflexed after anthesis; petals broadly lanceolate, 2-toothed at apex. N. Y. to Minn., south Ga. to Ark. B.M. 3342. Gn. 22, p. 375.

17. **Califórnica,** Durand. Perennial, 4 in. to 4 ft. high, procumbent or suberect, with large, deep red, scattered fls. and a taproot descending 2–3 ft.: stems several, leafy: lvs. lanceolate or ovate-elliptic: fls. 1 in. or more broad; petals variously cleft, most commonly with 2 broad lobes, flanked by 2 narrower ones, appendaged. Coast Range.—Offered by western collectors in 1881, but probably not in cult., though presumably a very distinct and desirable plant. This species seems to have been overlooked by Williams.

18. **Ménziesii,** Hook. Perennial: stems weak, dichotomously branched, 6–12 in. or more high: lvs. ovate-lanceolate: fls. white, "very small for the genus" (not ordinarily exceeding 6–8 lines in diam.), borne in the forks of the branches and forming a leafy inflorescence; petals white, 2-cleft, commonly but not always unappendaged. Rocky Mts. and Pacific slope.—Offered in 1881 by western collectors but probably not cultivated.

19. **Doùglasii,** Hook. Perennial, 1 ft. or more high, with white or pink fls. borne mostly in long-peduncled, 3-fld. cymes: stems very slender, decumbent: lvs. remote, linear, 2–3 in. long; petals 2-lobed, appendaged. June–Sept.—A common and polymorphous species in western N. Amer. Robinson describes 6 botanical varieties with no important floral differences. *S. Douglasii* is still found in one eastern catalogue. Var. **Macoùnii,** Robinson, was offered in 1881 under its synonym *S. Lyalli*, Wats.

20. **Scoùleri,** Hook. Perennial, 1½–2½ ft. high, with white or purplish fls.: root stout: stems unbranched: lvs. narrowly oblanceolate: inflorescence 6–8 in. long, verticillately spicate: petals bifid, appendaged. Mountains of Oregon and north.—Offered in 1881 by western collectors.

S. orientàlis, Mill., is an old name which is not accounted for by Williams, DeCandolle, Boisser, Nicholson, Mottet or Voss. According to Thorburn & Co., it is a hardy perennial, 2 ft. high, with rose-colored fls., which may be readily grown from seed in any light, loamy soil.

W. M.

SILK COTTON TREE. See *Bombax* and *Pachira*.

SILK FLOWER. *Albizzia*.

SILK OAK. *Grevillea robusta*.

SILK TREE. *Albizzia Julibrissin*.

SILK VINE. *Periploca Græca*.

SILKWEED. *Asclepias*.

SÍLPHIUM (from the Greek name of an umbelliferous plant of northern Africa). *Compósitæ*. Rosin-weed. A genus of 11 species of tall-growing hardy perennial herbs native of the U. S., with somewhat coarse leaves and rather large, sunflower-like heads of flowers which are yellow, except in one species: heads many-fld.: involucre of thick, somewhat foliaceous bracts: ray-fls. or at least their ovaries in more than 1 series, fertile, and with elongated exserted deciduous ligules: akenes much flattened, falling free or only with the subtending bract. Silphiums are of easy culture in any good soil. They require full sunlight and are propagated by division or seed.

A. *Foliage much cut.*

laciniàtum, Linn. Compass Plant. Stem about 6 ft. high, leafy at the base, much less so above: lvs. 1 ft. long or more, once or twice pinnately parted, the lobes oblong or lanceolate: fl.-heads several, sessile or short-peduncled, 2–5 in. across; rays 20–30. July–Sept. Western prairies. B.B. 3:408.

AA. *Foliage not cut.*

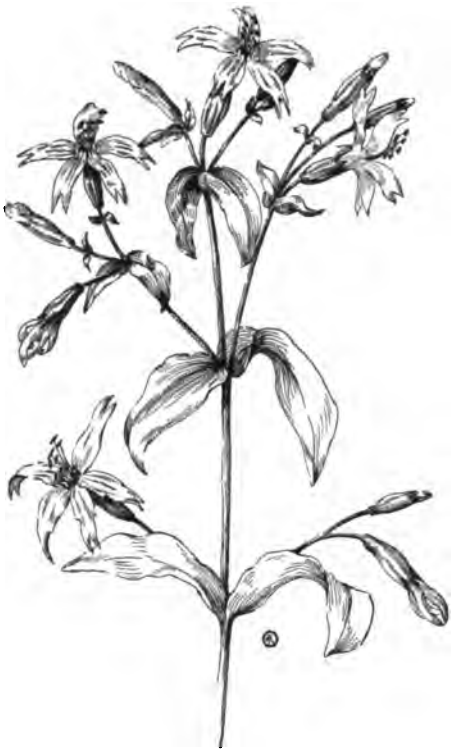
B. *Stem-lvs. small.*

terebinthinàceum, Jacq. Prairie Dock. Stem about 6 ft. high: lvs. nearly all basal, usually 1 ft. long, ovate, cordate, dentate: fl.-heads 1½–3 in. across; rays 12–20. July–Sept. Western prairies. B.B. 3:408.

BB. *Stem-lvs. large.*

C. *Lvs. connate-perfoliate.*

perfoliàtum, Linn. CUP PLANT. Stem square, usually dentate, branched above, about 6 ft. high: lvs. thin, ovate or deltoid-ovate, the lower contracted into margined petioles, the upper opposite, connate-perfoliate: fl.-heads 2–3 in. across, with 20–30 rays. July, Aug. Western prairies. B.B. 3:406.



2329. Silene Virginica (× ½). (See page 1669.)

CC. *Lvs. petioled or simply sessile.*

integrifòlium, Michx. Stem 2–6 ft., obtusely 4-angled to terete: lvs. lanceolate-ovate to ovate-lanceolate, opposite: fl.-heads 1–2 in. across, with 15–25 rays. Aug., Sept. Western prairies. B.B. 3:407. F. W. BARCLAY.

SILVER BELL TREE, *Halesia.* **S. Bush,** *Anthyllis Barba-Jovis.* **S. Tree,** *Leucadendron;* also *Elæagnus.* **S. Weed,** *Potentilla anserina.*

SILYBUM Mariànum, Gaertn., Blessed or Holy Thistle, is sometimes grown in old European gardens for ornament, and also for the edible heads, roots and leaves. It is a large fld. thistle 2–4 ft., perennial. S. Europe. Known also as *Carduus Marianus,* Linn.

SIMMÓNDSIA (named for the naturalist, F. W. Simmonds). *Euphorbiàceæ.* A monotypic genus differing from Buxus in the numerous stamens and one-seeded carpels: diœcious: rudiment of pistil absent from the staminate fls.

Califórnica, Nutt. A much-branched shrub with small, sessile, entire, coriaceous, oblong-lanceolate lvs.: staminate fls. clustered and the much larger pistillate fls. single in the axils. Dry sand hills of southwestern U. S. —Sometimes cult. for the oil of the seeds, used as a hair tonic. Cult. in S. Calif. J. B. S. NORTON.

SIMPLER'S JOY. See *Verbena.*

SINÀPIS. Included under *Brassica.*

SINNÍNGIA (after Wilhelm Sinning, gardener at the University of Bonn). Including *Rosanowia. Gesneràceæ.* A genus of about 16 species of Brazilian tuberous herbs. The generic characters of Sinningia are: pubescent or villous herbs from a tuberous rhizome: lvs. opposite, usually large, petioled, the floral ones reduced to bracts: fls. usually large, solitary or fascicled, in the axils, pediceled; calyx-tube shortly and broadly turbinate, adnate, 5-angled or 5-winged, the limb foliaceous, broadly 5-cleft or parted; corolla-tube nearly equal at the base or the posterior gibbous, long or broadly cylindrical, the upper part swollen or bell-shaped; lobes 5, spreading, or the 2 posterior smaller; stamens included, attached to the tube of the corolla; anthers broad, the cells confluent at the apex: glands of the disk 5, distinct, or the 2 posterior more crowded together or connate: ovary half inferior; style dilated at the tip: stigma concave, entire or slightly 2-lobed. The genus includes the florists' Gloxinia, which is properly *Sinningia speciosa,* Hiern., but which is treated in this book under *Gloxinia.* Other than this species, the Sinningias are little known horticulturally. Culture as for Gloxinia.

conspícua, Benth. & Hook. (*Rosanòwia conspicua,* Regel). Root tuberous: stem 1 ft. high: lvs. ovate-oblong, short-acuminate, somewhat heart-shaped at the base and dentate: fls. yellow, paler on the outside, marked on the lower part of the tube with purple dots and lines; calyx-tube entirely united with the ovary, equally 5-parted, the segments lanceolate, spreading; corolla-tube obliquely and narrowly campanulate, swollen and recurved at the base; glands of the disk 2: capsule 1-celled: seeds many.

ornàta, Benth. & Hook. (*Rosanòwia ornàta,* Van Houtte). A hybrid of the above species with a garden variety of Gloxinia with flowers of a bright red; the result is a plant resembling *S. conspicua,* but differing in having the leaves tinted on the veins and petioles with purple and in having a somewhat more elegantly shaped flower, pure white with purple lines on the outside of the corolla-tube and the inside of a yellowish green, lined with purple. F.S. 23:2423.

Rosanòwia Hänsteini, Hort. John Saul, is apparently not known to botanists. F. W. BARCLAY.

SIPHOCÁMPYLUS (*siphon,* tube, and *kampylos,* curved; referring to corolla). *Lobeliàceæ.* About 100 tropical American herbs and shrubs, with long, showy tubular fls., red, orange or purplish in color and borne singly on long peduncles: bracts absent or rarely 2 very small ones. About 10 kinds are cultivated in European warmhouses, and propagated by cuttings. Allied genera are discriminated under Isotoma.

betulæfòlius, G. Don. Height 2–3 ft.: stem woody at base: branches rounded: lvs. alternate, petiolate, 3–4 in. long, cordate, acuminate, doubly serrate, nearly glabrous: peduncles 1-fld., as long as the lvs., thickened upwards: calyx-segments long awl-shaped, with a few notches; corolla 2½–3 in. long, tube vermilion, limb yellow. Brazil. B.M. 3973.—Tender perennial, not cult. in America, but interesting as one supposed parent of *Centropogon Lucyanus;* itself of little value.

W. M.

SIPHONÁNTHUS. See *Clerodendron Siphonanthus.*

SISSOO TREE. *Dalbergia Sissoo.*

SISYRÍNCHIUM (an old Greek name first applied to some other plant). *Iridàceæ.* SATIN FLOWER. BLUE-EYED GRASS. RUSH LILY. About 60 species of American perennials, usually with fibrous roots, grass-like, narrow or terete lvs. and simple or branched stems often flattened and winged, bearing clusters of usually blue or yellow fls. subtended by two spathes: perianth nearly flat or bell-shaped; segments 6, nearly equal, obovate or oblong; stamens inserted on the base of the perianth; filaments more or less connate: ovary subglobose to turbinate, 3-loculed, 3-valved. The species are of easy culture in any good garden soil. Useful in the wild border, where hardy.

A. *Fls. yellow.*

B. *Stem leafless.*

Califórnicum, Dryand. (*Marica Califórnica*, Ker-Gawl). A half-hardy perennial: stem 1½ ft. high, 2 lines through, broadly winged: lvs. many, shorter than the stem, about ½ in. broad: spathe 3–6-fld.: segments of perianth yellow, lined with brown, ½ in. long: capsule oblong. Calif. to Ore. B.M. 983.—Swampy grounds.

BB. *Stem leaf-bearing.*

C. *The stem slightly 2-edged.*

tenuifòlium, Humb. & Bonpl. A half-hardy perennial: roots fleshy, fibrous: stem ¼–1 ft. high, often branched low down: lvs. subterete or narrowly linear: spathes 3–4-fld.; segments of perianth pale yellow, ½ in. long. Mts. of Mexico. B.M. 2117, 2313.

CC. *The stem broadly winged.*

convolùtum, Nocca. A tender perennial: root fibrous, slender: stem about 1 ft. high, usually forked: lvs. linear: spathes 3–4-fld.: segments of perianth yellow, veined with brown, ½ in. long. Tropical America.

AA. *Fls. purple, blue or white.*

B. *Stem terete.*

grandiflòrum, Dougl. (*S. Doùglasii*, A. Dietr.). A hardy perennial: root fibers slender, long: stem simple, about 1 ft.: lvs. short, sheathing the lower part of the stem: fls. 2–3, cernuous; perianth-segments bright purple, rarely white, ¾ in. long. May, June. Northwestern U. S. B.M. 3509. B.R. 16:1364.—This is possibly the handsomest species in the trade. Var. **álbum** is also offered and is equally desirable.

BB. *Stem flat.*

C. *Spathes equal in length.*

graminoides, Bicknell (*S. ánceps*, S.Wats., not Cav.). A hardy perennial: stem winged, about 1 ft. high, usually terminating in 2 unequal branches, subtended by a leaf: lvs. nearly equaling the stem, grass-like, 1–3 lines wide: spathes about 1 in. long, 2–4-fld.; pedicels longer than the spathes: fls. blue, ½–¾ in. across. April-June. Eastern U. S. B.B. 1:453.

C. *Spathes very unequal in length.*

angustifòlium, Mill. (*S. ánceps*, Cav. *S. Bermudiánum*, Authors). A hardy perennial: root-fibers long: stem about 1 ft. high, 1½ lines through, with 2–3 clusters on long-winged peduncles: lvs. linear, shorter than the stem, 1–1½ lines wide: spathes 1–4-fld., about 1 in. long: pedicels about 8 lines long. May–Aug. Me. to Va., west to Colo.—Var. **béllum** (*S. béllum*, Wats.). Stems more narrowly winged, usually without any leaf below the fork: spathes shorter: pedicels longer. Calif. and New Mexico. Var. **mucronàtum** (*S. mucronátum*, Michx.). Stems not branched, usually leafless, ending in a sessile cluster overtopped by a linear bract. Rocky Mts. and British North America.

F. W. BARCLAY.

SITOLÒBIUM is referred to *Dicksònia cicutària*, Swz., a handsome, strong-growing tropical American fern with lvs. 4–8 ft. long, bipinnate, papery, light green; petioles hairy; lower lfts. 1–1½ ft. x ½ ft.

SÌUM (from *Sion*, old Greek name used by Dioscorides). *Umbelliferæ.* Four widely scattered herbs with pinnate foliage and small white fls. borne in compound umbels. Glabrous plants: leaf-segments dentate: petals inflexed at the tip. For *S. Sisarum*, see *Skirret.*

S. latifòlium, Linn., the WATER PARSNIP, is a British species sometimes naturalized in English wild gardens, especially in damp woods. Like Ferula and certain other umbelliferous plants, it is valued more for its stately habit and handsome foliage than for its flowers.

W. M.

SKÌMMIA (Japanese *Skimmi*, meaning a hurtful fruit). *Rutàceæ.* Ornamental evergreen shrubs with alternate entire leaves, small white flowers in terminal panicles and showy bright red berry-like fruit. They are tender, not being reliably hardy as far north as Washington, D. C. Handsome shrubs for borders of evergreen shrubberies and especially valuable for planting in cities, as they belong to the best smoke-enduring evergreen shrubs; they are particularly beautiful when covered with their bright red fruits, which are retained through the whole winter if not eaten by birds. In the greenhouse two crops of berries on a plant may be seen occasionally. The Skimmias are of rather slow growth and thrive best in a sandy loamy soil, but also grow well in strong clay; they prefer a partly shaded situation. On account of their handsome fruits they are sometimes cult. in pots in a sandy compost of peat and loam. As the Skimmias are polygamous and mostly unisexual, it will be necessary to plant staminate plants among the pistillate ones to secure well-fruited specimens. Prop. by seeds sown in fall or stratified and by cuttings under glass with gentle bottom heat. William Scott writes: "Seeds sown in the fall and grown along in a coolhouse during winter can be planted out in a good loam the following spring, when they will make a vigorous growth, and can be lifted the following October. Their red berries make them very desirable as a Christmas berry plant."

Three species from the Himalayas to China and Japan. Glabrous shrubs: lvs. dotted with translucid glands: fls. polygamous or diœcious, the staminate fragrant and in large panicles; sepals and petals 4–5; stamens 4–5; style with 2–5-lobed stigma: ovary 2–5 loculed: fr. a drupe with 2–4 one-seeded stones.

Japónica, Thunb. (*S. oblàta*, Moore. *S. fràgrans*, Carr. *S. fragrantíssima*, Hort.). Shrub, 5 ft. high: lvs. crowded at the ends of the branchlets, short-petioled, elliptic-oblong to oblong-obovate, narrowed at both ends, obtusely pointed, bright or yellowish green above, yellowish green beneath, 3½–5 in. long: panicles 2–3½ in. long: fls. polygamous, usually 4-merous, yellowish white: fr. coral-red or bright scarlet, subglobose and somewhat angular, ¼ in. across. Spring. Japan. S.Z. 1:68. G.C. II. 25, p. 244; III. 5, p. 521, 524. Gn. 7, p. 183; 35, p. 480; 42, p. 133. J.H. III. 30, p. 525. R.H. 1869, p. 259; 1880, p. 56. F. 1865, p. 161.—*S. fragrans* and *fragrantissima* are names of the staminate plant; *S. oblata* of the pistillate. Var. **ovàta**, Carr., has larger and broader lvs. R.H. 1880, p. 58. Var. **Vèitchi**, Carr., has obovate lvs. and perfect fls. R.H. 1880, p. 58.

Fórtunei, Mast. (*S. Japónica*, Lindl.). Similar to the preceding but of dwarfer habit: lvs. lanceolate or oblong-lanceolate, acuminate, dark green above, light green beneath, 3½–10 in. long: fls. white, in oblong-ovate panicles, usually perfect: fr. obovate, dull crimson-red. Spring. China. G.C. II. 25, p. 245 (as *S. oblata*); III. 5, p. 525. The following as *S. Japonica:* B.M. 4719; F.S. 7, p. 39; Gn. 7, p. 183 and 8, p. 519; R.H. 1869, p. 259, and 1880, p. 56. This species fruits more freely than the preceding. Var. **rubélla**, Rehd. Peduncles, pedicels and buds reddish; staminate form. R.H. 1874:311; 1885, p. 189. Var. **argéntea**, Nichols., has the lvs. bordered with white. A hybrid between this and the preceding species is probably *S. intermèdia*, Carr., with narrow oblong-elliptic lvs. dark green above. To this hybrid belong also *S. Fóremani*, Hort., with lanceolate or oblanceolate yellowish green lvs. and subglobose and obovate fr. on the same panicle (G.C. III. 5:553) and *S. Rógersi*, Hort., with similar but deep green lvs. and globose squarish fruit.

S. Laurèola, Sieb. & Zucc. Shrub, 5 ft. high, of a strong aromatic odor when bruised: lvs. narrow-oblong to obovate, acute or acuminate, bright green: fls. 5-merous. Himalayas.

ALFRED REHDER.

SKIRRET (*Sium Sisarum*, Linn.) is a vegetable of minor importance the roots of which are used like salsify or oyster plant. It is a hardy, perennial, umbelliferous herb, native to eastern Asia. It grows 3–4 ft. high, has pinnate foliage and small white fls. in compound umbels. The roots grow in large clusters, something like those of a sweet potato or dahlia, but they are much longer, more cylindrical and somewhat jointed. The roots have a sweet and slightly floury taste and if well grown are tender. The chief objection to this vegetable is the woody core, which must be removed before cooking, as it is not easily separated from the fleshy part at the table and detracts from its quality. The thickness of the core varies greatly, no matter whether the plants are propagated by seed, offsets or division of roots.

Skirret belongs to a moisture-loving genus, and needs a rich soil. The seeds may be sown in autumn or spring and the plants yield well the first season. For European practice Vilmorin recommends that the seedlings be grown in a seed-bed until they have made 4 or 5 leaves and then transplanted into permanent quarters. Sow the seed in drills half an inch deep, and thin out the seedlings to 8 inches in the row. The roots may be left outdoors in the ground all winter, but others advise storing them in sand or earth. W. M.

SKULL CAP. *Scutellaria.*

SKUNK CABBAGE. *Spathyema fœtida.*

SLIPPER FLOWER or **SLIPPERWORT.** *Calceolaria.*

SLIPPER, LADY'S. *Cypripedium.*

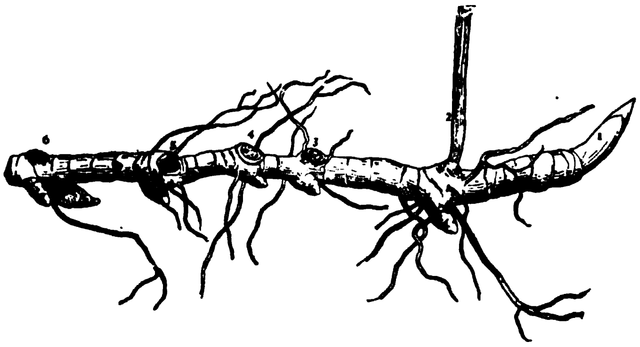
SLIPPERS, BABIES'. *Lotus corniculatus.*

SLOE. *Prunus spinosa.*

SMELÓWSKIA (Prof. T. Smelowskia, botanist of St. Petersburg, died 1815). *Cruciferæ.* About 4 species of alpine plants with small white or yellow, 4-petaled flowers: sepals short, lax, equal at base: pod somewhat shortish, narrowed at both ends: seeds few, arranged in 1 series: lvs. 1-2-pinnatisect: fls. racemose: bracts none.

calycina, C. A. Meyer. Low, tufted perennial, very variable in foliage: lvs. soft, usually deeply pinnatifid, with 2 or several pairs of linear to obovate, obtuse segments and a terminal one: rarely a few lvs. entire: racemes at first dense and subcorymbose, but elongating in fruit: fls. white or nearly so: petals about 2 lines long. Arctic regions. Recommended by some persons for rock gardens, but it does not seem to be advertised in America. W. M.

SMILACÌNA (resembling smilax). *Liliàceæ.* FALSE SOLOMON'S SEAL. About 25 species of hardy perennial herbs of the temperate regions of North America and Asia, with rhizomes (Fig. 2330) and simple leafy stems bearing terminal panicles of small usually white or greenish white flowers: perianth of 6 equal spreading segments; stamens 6, inserted at bases of the perianth-segments: berry globular or nearly so, 3-celled.



2330. Rootstock of Smilacina racemosa (× ½).

The figures designate the position of the stalks in the different years. Between each of the figures or scars is a year's growth.

Smilacinas are of easy culture in any good soil. They prefer a rich loam in a moist but not wet, partly shaded place. They are handsome plants both in foliage and flower. *S. racemosa* is probably the most attractive. The plants may be forced slowly for bloom in the late winter and early spring.

A. *Fruit red.*

B. *Plant with 2–4 leaves.*

trifoliàta, Desf. Rootstock slender: stem 2–15 in. high: lvs. sessile, oval to oblong-lanceolate, 2–5 in. long: fls. in a simple raceme, few to several: berry ¼ in. through. Bogs and moist soil in the northern U. S. and Asia. B.B. 1:430.

BB. *Plant with many lvs.*

racemòsa, Desf. Figs. 2330, 2331. Rootstock rather stout: stem 1–3 ft. high: lvs. 3–6 in. long, oblong-lanceolate or oval, sessile or nearly so: fls. numerous, in a panicle: berry ¼ in. through. In shaded or partly shaded places throughout the greater part of the U. S. B.B. 1:429. A.G. 13:519.

AA. *Fruit black, or green and black.*

B. *Pedicels 2–7 lines long.*

sessilifòlia, Nutt. Rootstock slender: stem 1–2 ft. high, slender: lvs. 2–6 in. long, lanceolate, acute, flat and spreading: raceme open, sessile or short-peduncled: berry 3–5 lines through. Early summer. Pacific states.

BB. *Pedicels 1–2 lines long.*

stellàta, Desf. Very near to *S. sessilifolia:* lvs. usually folded and ascending: raceme shorter and more crowded. May, June. Moist soil, throughout the greater part of the U. S. B.B. 1:430. F. W. BARCLAY.

SMÌLAX (ancient Greek name). *Liliàceæ.* A genus of about 180 species very widely distributed over the world, usually woody climbers, which ascend by means of the coiling appendages of the petiole; sometimes shrubs or rarely herbaceous perennials, with slender twigs: rootstocks usually large and often tuberous: lower lvs. reduced to scales; the upper simple, 3 or rarely several-nerved, often evergreen: fls. usually numerous, rather small, diœcious, in axillary, sessile or peduncled umbels: pedicels nearly equal in length: berries usually globose, 1–4-seeded.

There are 17 species native of the U. S., nearly all of which are useful wild garden plants, having glossy attractive foliage. The last three noted below have been offered by collectors. For Smilax of florists, see *Asparagus medeoloides.*

A. *Lvs. usually variegated. Exotic species.*

B. *Plant climbing.*

argyrèa, Lind. & Rod. Tender foliage plant: stem wiry, slender, armed with short, stout thorns: lvs. lanceolate, becoming 8–10 in. long, dark green, blotched with gray. 3-nerved, short-petioled. Bolivia. I.H. 39:152.—According to G.F. 8:305 the above species is a robust healthy plant doing well in a moderate temperature and quickly forming ornamental specimens. It should be given a rich, fibrous soil and a light and sunny position. It may be propagated by half-ripe cuttings of the side shoots with 2–3 eyes inserted in a moderately warm bed.

BB. *Plant partially climbing.*

áspera, Linn. A half-hardy shrub often somewhat scandent, unarmed or with spines: lvs. ovate-deltoid or lanceolate, 1½–6 in. long, usually blotched with white, 5–9-nerved: fls. white, sweet-scented, in many-fld. umbels: berries ¼ in. thick, usually 3-seeded and, according to J. D. Hooker, bluish, while Franceschi mentions them in his catalogue as shining red. S. Eu. to India. Gn. 28, p. 615.

AA. *Lvs. green. Native species.*

B. *Stem herbaceous.*

herbàcea, Linn. A hardy perennial with a somewhat procumbent or climbing branched annual stem 4–6 ft. high, unarmed: lvs. ovate to lanceolate acute to cuspidate, obtuse or cordate at the base, long-petioled, 7–9-nerved: umbels 15–80-fld., long-peduncled: fls. carrion-scented when open: berry bluish black, ¼ in. thick. Apr.–June. In woods or fields throughout the greater part of the U. S. B.B. 1:439.

BB. *Stem woody.*

C. *Foliage evergreen.*

laurifòlia, Linn. Stem stout, high-climbing, armed with straight prickles: branches angled, mostly unarmed: lvs. leathery elliptic or oblong-lanceolate, 3-nerved: umbels 6–30-fld., on short, stout peduncles: berries black, ovoid. N. J., south and west to Ark.

2331. Smilacina racemosa (× ⅓).

CC. *Foliage deciduous.*

Wàlteri, Pursh. Stem climbing, angled, prickly below: branches unarmed: lvs. ovate to ovate-lanceolate obtuse or abruptly acute, 5–7-nerved: umbels 6–15-fld., on short peduncles: berries coral-red or rarely white. Wet soil, N. J. to Fla. west to Mississippi river. B.B. 1:442.

F. W. BARCLAY.

SMOKE TREE. *Rhus Cotinus.*

SMUT. A prevalent disease of many cultivated cereal grasses and other plants caused by the attack of a fungus of the class ustilagineæ, sometimes producing swellings on various parts of the host, the swellings being eventually filled with brownish or blackish spores known as chlamydospores, which emerge, as a fine dust-like powder, when the outer membrane of the hypertrophic tissues bursts or cracks. The smut on Indian corn may be taken as typical. The disease usually appears first on the leaves, afterwards at the junction of leaf-sheath and blade; finally the ear of corn is attacked, and the tassel. On the leaves blisters are found; on the ear, large, whitish polished swellings appear. As the spores mature, the swellings become darker in color, and the inclosing membrane finally ruptures, exposing the dark olive-green mass of spores. Unlike most other cereals, maize can be inoculated at any age. Several smuts have been described; viz., loose smut of oats (*Ustilago avenæ*), maize and teosinte smut (*Ustilago zeæ*), stinking smut of wheat (*Tilletia tritici*), rye smut (*Urocystis occulta*), onion smut (*Urocystis cepulæ*), and colchicum smut (*Urocystis colchici*). For an account of the grain smuts, see Swingle, Farmers' Bull. 75, U. S. Dept. Agric.

JOHN W. HARSHBERGER.

SNAILS. See *Caterpillars* and *Worms.*

SNAKE CUCUMBER. A form of *Cucumis Melo.*

SNAKE GOURD. See *Trichosanthes.*

SNAKEHEAD. *Chelone.*

SNAKEROOT. Black S. *Cimicifuga racemosa* and *Sanicula Marilandica.* **Button S.** *Liatris.* **Canadian S.** is *Asarum.* **Seneca S.** *Polygala Senega.* **White S.** *Eupatorium ageratoides.*

SNAKE'S BEARD. *Ophiopogon.* **Snake's Head Iris.** *Hermodactylus.* **Snake's Head Lily.** *Fritillaria Meleagris.*

SNAKE'S MOUTH. *Pogonia.*

SNAKE'S TONGUE. *Ophioglossum.*

SNAPDRAGON is *Antirrhinum.*

SNEEZE WEED. *Helenium.*

SNEEZEWOOD. See *Ptæroxylon.*

SNEEZEWORT is *Achillea.*

SNOWBALL TREE. *Viburnum Opulus.*

SNOWBERRY. Consult *Chiococca* and *Chiogenes;* also *Symphoricarpus.*

SNOWDROP. See *Galanthus.*

SNOWDROP TREE. *Halesia.*

SNOWFLAKE. *Leucojum.*

SNOW FLOWER. *Chionanthus.*

SNOW GLORY. *Chionodoxa.*

SNOW-ON-THE-MOUNTAIN. *Euphorbia marginata.*

SNOW PEAR. *Pyrus nivalis.*

SNOW TREE. *Pyrus nivalis.*

SNOW WREATH. *Neviusia Alabamensis.*

SOAP BARK TREE. *Quillaja Saponaria.*

SOAP BERRY. *Sapindus.*

SOAP BULB. *Chlorogalum.*

SOAP-PLANT. See *Chlorogalum.*

SOAPWORT. *Saponaria officinalis.*

SOBOLÈWSKIA (after G. Sobolewski, Russian botanist). *Cruciferæ.* About 2 species of Asiatic annual or biennial, erect, branching herbs, with long-petioled, roundish, coarsely serrate leaves and white flowers borne in numerous corymb-like racemes: silique clavate, compressed or nearly terete, curved, coriaceous, inflated at the apex, 1-celled, 1-seeded.

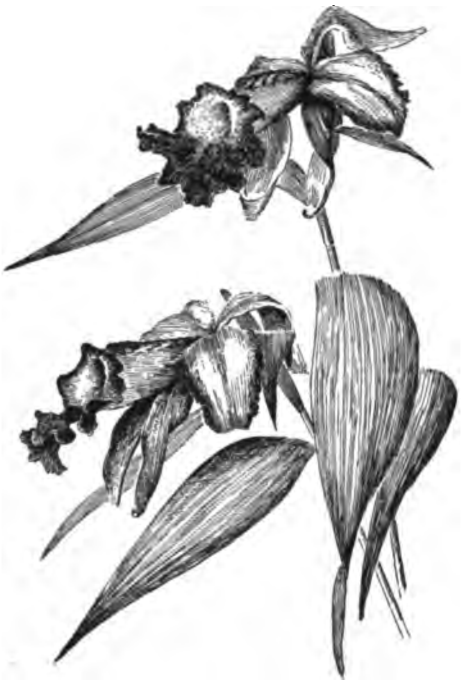
clavàta, Fenzl. Basal lvs. reniform-cordate, the upper nearly sessile: silique 2½ lines long by 1¼ lines wide. May.—Offered by John Saul in 1893.

F. W. BARCLAY.

SOBRÀLIA (after Fr. Mart. Sobral, a Spanish botanist). *Orchidàceæ.* This is a genus of extremely handsome orchids with a very distinct habit. The plants have slender, reed-like stems clothed with leaves throughout their entire length. The stems are tufted, forming bushy plants varying in height according to the species. The flowers are among the largest of the orchids, those of *S. macrantha* attaining a diameter of 9 in. across the sepals. They are, however, very fugacious, fading a few days after opening. Lvs. with sheathing bases, plicate-venose: fls. membranaceous, few, in short, terminal racemes, or solitary; sepals and petals spreading; labellum convolute around the column, terminal portion large, undulate, often fimbriate, smooth

or with longitudinal ridges; column slender; pollinia 8. About 30 species, inhabiting the mountains of Mexico and tropical America. The following account comprises the species that appear to be in the American trade, but others are to be found in the collection of fanciers, as *S. Liliastrum*, Lindl., with large white yellow-veined fls.; *S. Wilsoni*, Rolfe, with large white fls. shaded with rose and spotted with purple; also various forms of *S. macrantha*, as vars. *nana*, *purpurea* and *albida*.
HEINRICH HASSELBRING.

Sobralias are charming orchids, and where room can be given to large plants they well repay the space and care they require. Many of them, to be sure, are very fugacious in their blooming, some lasting only a day, but nearly all of them make up for this by a succession of flowers which is more or less rapid. The individual blossoms are of a size to equal almost any orchid flower, and quite as graceful in their general appearance—far more graceful than most Cattleyas even. Where space for large and bushy plants can be afforded, some of the Sobralias will prove most charming plants, having the double advantage of presenting in a well-grown plant not only beautiful blossoms but a subject which is thoroughly good-looking as a foliage plant. They also have the added advantage of being, in most instances, of rather easy culture. Given a suitable soil and a liberal supply of water they are almost sure to grow and bloom, although they will do better if they are given their time for rest, when less water is allowed without permitting the material about the roots ever to become quite dry.



2332. Sobralia macrantha (× ⅓).

The flowers of many Sobralias are very fugacious, some lasting only one day, but nearly all of the varieties make up for this fault by a succession of flowers more or less rapid through a blooming period of, in some instances, many weeks. In size the individual blossoms vary from that of an ordinary *Cattleya labiata* to one scarcely an inch and a half across, and the plants themselves present as great variety, ranging from such as *S. fragrans*, which grows less than a foot high, to that giant of the tribe *S. Cattleya*, which will reach a height of nearly ten feet. They also give as much variety in their coloring, ranging from a shade of lavender which is almost a blue through different shades of purple to the rich claret color of *S. Lowii*, and from yellow to the purest white.
F. J. LE MOYNE.

A. *Fls. white (see also Nos. 4 and 6)*..1. **leucoxantha**
AA. *Fls. yellow.*
B. *Height 2 ft*........................2. **xantholeuca**
BB. *Height 1 ft*........................3. **fragrans**
AAA. *Fls. chiefly purple or rose*.........4. **macrantha**
5. **Brandtiæ**
6. **Fenzliana**
7. **Holfordii**
8. **Cattleya**
9. **Lowii**

1. **leucoxántha**, Reichb. f. Stems tufted, 3 ft. high, spotted: lvs. 4–6 in. long, lanceolate, acuminate: fls. 6–7 in. across; sepals linear-lanceolate, spreading and recurved, white; petals shorter, oblong, undulate above, also pure white; labellum with a ventricose tube; limb large, circular, notched in front and the margin irregularly lobulate and wavy, throat golden yellow, with a few brownish stripes. Aug. Costa Rica. B.M. 7058. R.B. 23:205. J.H. III. 33:77.

2. **xantholeùca**, Reichb. f. Stems about 2 ft. high, tufted: lvs. spreading and drooping, lanceolate, 6–7 in. long, with speckled sheaths: fls. solitary, lemon-yellow, with a deeper shade on the lip: sepals linear-lanceolate, spreading and recurved; petals similar but shorter; blade of the labellum orbicular, crisp and undulate, margin crenate. Guatemala. B.M. 7332. R.H. 1890:12. G.C. III. 5:9. Gn. 22:366.—A species with flowers about as large as *S. macrantha*, but plants of more compact habit.

3. **fràgrans**, Lindl. A small species with stems about 1 ft. high: lvs. 1 or 2, oblong-lanceolate, 4–5 in. long: fls. 2–3 on a long peduncle, about 2 in. long, pale sulfur-yellow; sepals oblong, spreading; petals similar but erect; middle lobe of the labellum fimbriate on the margin and having many fimbriated crests. Columbia. B.M. 4882.—One of the smallest of the genus.

4. **macrántha**, Lindl. Fig. 2332. Stems tufted, reedlike, 4–7 ft. high, leafy all the way up: lvs. broadly lanceolate to oblong-lanceolate, long-pointed, 8–10 in. long: fls. several at the ends of the stems, rose-purple, with the front of the labellum deep purple; sepals linear-oblong, 4⅓ in. long, reflexed and twisted; petals broader, oblong, wavy above; labellum 5 in. long, with the expanded portion almost circular, 3 in. across and 2-lobed at the apex, very wavy; tube long, whitish within, with a yellow stain in the throat and several thin yellow ridges. May–July. Mexico and Guatemala. B.M. 4446. F.S. 7:669. P.M. 14:241 (var.). G.M. 31:559. Var. **Kienastiàna** (var. *alba*) has white fls.

5. **Brándtiæ**, Krzl. Stems 3 ft. high: lvs. lanceolate, acuminate, 8 in. long: fls. purple-rose, paler outside, with the labellum darker and having a yellow disk; sepals linear; petals twice as wide; middle lobe of the labellum very broad, divided into 2 diverging, rather acute lobes; anther-bed with a long recurved horn on each side. Resembles a medium-sized *S. macrantha*, distinguished by the long horns of the column, and black spots (not hairs) on the leaf-sheaths. S. Amer.

6. **Fenzliàna**, Reichb. f. Stems slender: sheaths blackish, asperulate: lvs. oblong, acutish: fls. rose-colored; sepals oblong, acute; petals obovate-cuneate, three-fourths as long as the sepals; labellum spreading, front portion ovate, notched, crenulate; horns of the column equaling the anther. Nicaragua.—Var. **álba**, Hort., has pure white flowers.

7. **Hólfordii**, Sander. Plants of dwarf habit: fls. rose-carmine, deeper in the lip, shading to whitish in the throat. Habitat not stated by Sander.

8. **Cattlèya**, Reichb. f. Stem stout: lvs. oblong, acuminate, plaited, bearing several lateral clusters of strong, thick fls. of a firm fleshy texture, with purplish brown sepals and petals and a purplish lip, with a white column and three yellow lines over the center of the lip. Colombia.

9. **Lówii,** Rolfe. An imperfectly known species introduced about 1892 from Colombia. It grows about 1½ ft. high and has fls. of a bright uniform purple.

The following trade names are not accounted for: *S. magnifica.—S. Pfaùii.—S. virginàlis.*

Heinrich Hasselbring.

SOIL. The soil is a superficial covering of the earth's crust, more or less well adapted to the growth of plants. It is usually only a few inches thick. Below this is a subsoil often differing, especially in humid climates, from the soil proper in color, texture, or chemical composition. A very striking definition has been suggested by Sir John B. Lawes, who considered the soil to be rotten subsoil, and the subsoil rotting rock. The term soil is occasionally used in a more comprehensive way to include both the soil and the subsoil.

The soil adapted to the growth of the higher plants consists of fragments of rocks or minerals, organic matter, soil solution, and a soil atmosphere. The mineral fragments vary in size from the finest clay particles to gravel and even boulders. The organic matter is derived from low organisms, from previous vegetation, or from growing plants; as also from stable manure, and occasionally fish or animal matter added to the soil by man. The soil solution consists of water carrying dissolved substances derived from the soil grains and from the organic matter, as well as from fertilizing materials artificially applied, and constitutes a nutrient solution from which the plant derives its mineral constituents. The soil atmosphere differs from the ordinary atmosphere above the soil in being richer in carbon dioxid and nitrogen, and containing more water vapor and less oxygen.

In origin there are two main classes of soils: sedentary soils, formed by the disintegration and decomposition of rocks in place; and transported soils, including those of alluvial, glacial and æolian origin. The word alluvial is here used to include all water-transported material; the term is, however, frequently used in a more specific sense to indicate the recent flood deposit of rivers.

Soils are classified according to their origin and their mechanical and chemical composition and properties. Genetically, they are classified according to the rock from which they are derived, as granite soil, limestone; or according to the manner of their origin, as alluvial, lacustrian or drift. Mechanically, they are classified broadly into stony, gravelly, sandy, sandy loam, loam, clay loam, clay, adobe, black-waxy, or, according to some other physical property; chemically, into calcareous, humus, alkali, and according to other striking chemical features. In the soil survey of the U. S. Department of Agriculture a local name is adopted for each type under which the specific characters are given; examples of this are Hartford sandy loam, Norfolk sand, San Joaquin adobe, Glendale loess.

The physical properties of soils concern the size and arrangement of the particles, and the relation of these to each other and to the organic matter; also the soil atmosphere, the soil moisture, and the physical forces of heat and gravitation. In these there is an intimate relation with physiography or the form and exposure of the surface of the land, as well as to climatology.

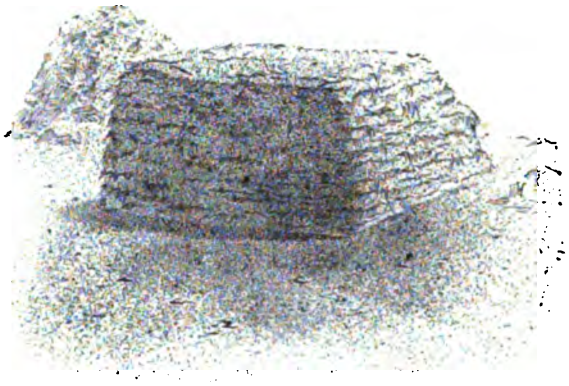
There are undoubtedly constant physical changes going on in the soil, as well as chemical changes, which have much to do with the best development of vegetation. The soil moisture may be looked upon as a nutrient solution dissolving its material from the difficultly soluble compounds in the soil and from fertilizers artificially applied. The amount of substances in solution varies with the moisture content and with the way moisture is supplied to the soil. The dissolved substances, naturally present in the soil or derived from fertilizers, influence the solubility of the soil components, rendering them more or less soluble according to their nature and existing conditions. It is probable that there is a normal weathering of the soil material which produces a certain concentration in the soil solution which will be maintained on the gradual withdrawal of nutrient material by the plant. However, this natural weathering is often not sufficient in amount to produce the yield and quality of crops desired, and this may be increased by methods of cultivation and fertilization so that crops may annually remove larger quantities of nutrient substances without any particular exhaustion to the soil.

It is certain that these nutrient materials do not accumulate to any considerable extent in soils in humid countries, as they are liable to be leached away and also to recombine, forming difficultly soluble compounds with the material of the soil grains. A soil is in good heart or good condition when the physical conditions, such as the water supply, soil atmosphere and temperature relations, are favorable, and when the weathering of the material is sufficient to furnish an abundant and constant nutrient solution in the soil moisture.

One of the most potent agents in the weathering of soils is the organic material contained. This is unquestionably due largely to the amount of carbon dioxid formed, which renders many of the nutrient matters much more soluble. Moreover, the organic matter forms a culture medium for bacteria, ferments and the various organized and unorganized agents which assist in breaking down the organic material, and facilitate as well the weathering of the other soil components. Soils in general have remarkable power of absorbing on the surface of the soil grains vast quantities of carbon dioxid, ammonia and other gases, and of other nutrient materials, which while soluble and actually dissolved, do not readily diffuse out into the solution between the soil grains.

The influence of fertilizers is therefore twofold: the direct addition of plant-food for the immediate use of plants, and the action of the fertilizing components upon the solubility of the otherwise difficultly soluble compounds in the soil. There are other offices which are very strikingly shown in the case of lime. This substance when in the form of either caustic or slaked lime corrects the acidity which is very often present in soils. It changes the structure of soils. It renders some of the soil components much more soluble, especially when the lime is in the form of the sulfate or gypsum, and it has undoubtedly a physiological role which enables the plant to assimilate larger quantities of other nutrient matters even in amounts which would be detrimental if the lime salt were not present in excess.

The principal objects of the cultivation of the soil are to secure proper aëration, to conserve the moisture supply, and to improve the drainage. The irrigation and artificial drainage of soils are treated elsewhere.



2333. How the gardener makes his soil, by letting it decay in piles.
The larger pile is composed of sods.

The physical properties of texture and structure, that is, the size and arrangement of the soil grains, have a greater practical importance with field crops and the relation of crops to soil under extensive cultivation than upon horticultural crops either in the field or greenhouse, where intensive methods are used. Particularly in the eastern states, where the natural rainfall is relied upon for the water supply, these physical properties have great influence in determining the relation of crops to soils. This is due in large part to the influence of the physical properties upon the water supply, and the commercial values of many soils are dependent largely upon this one condition. This is notably the case with the early truck crops, with corn, wheat and grass lands, and with special products such as celery, cranberries and other horticultural crops. With intensive cultivation, however, the flavor, appearance, texture and general quality of the crop assume greater commercial importance, and even with intensive methods these are largely influenced by the character of the soil. This is shown in a striking manner in the localization of certain interests, even under the most intensive system of agriculture, such as the production of the fine lettuce around Boston, of the carnations, violets, tomatoes and roses in other districts. With the present specialization in these lines, it is not only necessary that one should have a knowledge of the methods of cultivation, but should have the proper soil conditions as well as suitable climatic conditions; and to such an extent has this specialization been carried that different varieties of roses, for example, are best grown in different localities where the soils are slightly different. These matters must be realized by the horticulturist in order to attain the highest degree of success in any particular undertaking. MILTON WHITNEY.

SOILS FOR POTTING.—Strictly speaking, there are but two distinct kinds of soils, though there are several modifications or physical differences in both. These are mineral soils and organic soils or peat. Peat is formed in temperate climates by the accumulation of vegetable matter in swamps, or in some parts of the world under peculiar atmospheric conditions (see *Peat*). Mineral soils, which cover the greater portion of the earth's surface, are formed by the disintegration of rocks and stones through the agency of water, frost or the atmosphere. Peaty soils are composed almost entirely of vegetable matter, with but little mineral matter. Mineral soils are just the reverse. The physical differences in peat are practically reduced to two; viz., the absence or presence of fiber. The physical differences in mineral soils vary considerably from almost pure clay to almost pure sand; indeed, the mechanical (or physical) analysis of mineral soils is based largely upon the proportions of clay and sand. The following table, taken from Tanner's "First Principles of Agriculture," is self-explanatory:

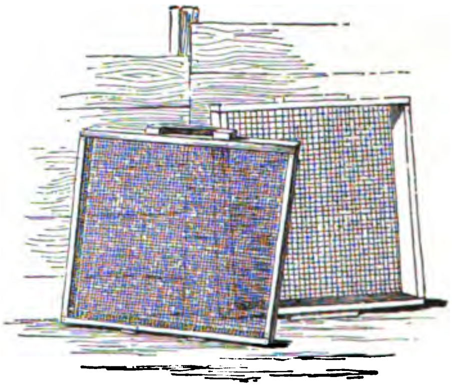
Name of soil	*Percentage of sand*
Sand	80 to 100
Sandy loam	60 to 80
Loam	40 to 60
Clay loam	20 to 40
Clay	0 to 20

It will be seen that when the proportions of sand and clay are equal or nearly so, the soil is then termed loam. Should clay or sand predominate it is then spoken of as a clay loam, or sandy loam. If other substances, such as lime or gravel, be present, the soil is then termed a calcareous or a gravelly soil.

The composition of soils can be still further known by chemical analysis, but to the average gardener this is not necessary. Moreover, it is an operation of great nicety and one that requires an experienced chemist to perform. The chemical constituents which plants derive from the soil are present in most soils, though in varying degree, but they are sure to be present in ample quantity in the potting soil selected by an experienced gardener. The air and water may furnish as much as 98 per cent of the material with which the plant body is built up in some cases, and only the remaining 2 per cent be strictly derived from the soil. The three most important nutrient elements are nitrogen, phosphoric acid and potash. Of the three, nitrogen is the most important, but all are present in varying degrees in most natural manures. Moreover, nitrogen composes four-fifths of the atmosphere and the soil absorbs it chemically through the action of bacteria when the soil is in good physical condition. Hence the importance of remembering always that air in the soil is as important as water. Sorauer, in his "Physiology of Plants," page 56, says: "The ideal condition of a soil is one in which it resembles a sponge, and in which it will retain the greatest amount of nutritive substances and water without losing its capacity for absorbing air." Therefore it will readily be seen that the physical condition of soil is far more important to the gardener than the chemical.

Mineral soils vary according to locality, but when the topography of any particular locality is of a hilly or mountainous character, the different variations or physical differences may often be found within the radius of a mile. The capacity of soils to retain moisture varies considerably. A clay loam is far more retentive of moisture than a sandy loam. The experienced gardener therefore selects a clay loam for his strong-rooting, large-leaved tropical plants, because transpiration is so much greater in these plants. For a general collection of greenhouse and small-growing tropical plants he selects a good loam. For cacti, agaves and other succulent plants which will not take as much water at all seasons as other plants, he selects a sandy loam. For ferns, most of the Ericaceæ and Gesneraceæ he selects peat; while for nepenthes, orchids, bromeliads and the epiphytic aroids he selects fern or kalmia root. Other materials which a gardener should always have on hand when he has a large and varied collection of plants are: leaf-mold, which is made by collecting leaves and storing for at least two years, turning them over occasionally to facilitate decay; living or fresh sphagnum moss; sand; charcoal, and some convenient manures, such as pulverized sheep manure and bone meal.

Growing plants in pots is very different from growing them in borders or the open ground. In pots, especially the larger sizes, the capacity of the soil for absorbing air is in a great measure restricted; therefore, the experienced gardener digs the turf only from good pasture or meadow land, so that it shall be full of the fibrous roots of the grass. Soils containing fiber will absorb air much more freely than that without fiber. But before using the turf for potting it should be placed in square piles, turf downwards, for at least six months in order to kill the grass and all vegetable life. Fern root should also be collected and stored the same length of time in order to kill out the ferns. Fig. 2333. Raw and very coarse soils are usually sifted before used for most greenhouse plants. Shallow sieves are used for this purpose. Fig. 2334.

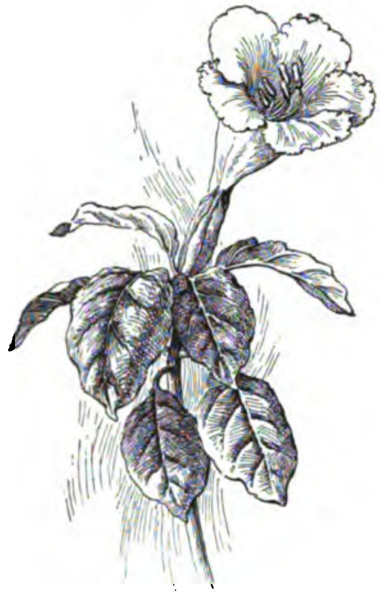


2334. Sieves for sifting or riddling soils.

Except for sowing seeds and for potting seedlings and freshly rooted cuttings, thoroughly decayed and homogeneous soils should not be sifted, but should be broken into small lumps, as the small lumps assist materially in aërating the soil. If the soil is sifted too much it becomes very fine, packs close and allows too little aëration. Leaf-mold is decayed vegetable matter, or humus. It may have little manurial value, but is used by gardeners to make soils "light" or spongy. For most young plants a good proportion added to the soil is excellent, as it encourages root growth.

Sand is the best medium for rooting cuttings of the majority of plants. It is also added to soils to increase their porosity, especially when potting very young plants. Silver sand is best for all purposes because it contains less oxides than red or yellow sands.

In potting plants, experienced gardeners make potting mixtures or add a variety of materials to the soil to suit the requirements of different plants. For young seedlings or for freshly rooted cuttings, the compost should be of a light and porous nature, but as plants increase in size and vigor a heavier and richer mixture is usually given, that is, if plants are to be grown on as specimens; but the proportion of nutrient substances used in a potting mixture should be determined by the vigor of the plants. It is always better to use too little plant-food than too much; if too much is used it often becomes available faster than the roots of plants can absorb it, and hence causes organic acids to form in the soils which are fatal to the roots of most plants. Many amateur plant-growers in their over-anxiety to grow fine plants make this fatal mistake.


2335. Solandra grandiflora (× 1-5).

In most gardens the greenhouse space is limited, and a gardener cannot always develop his plants to their fullest capacity or he has to reduce his variety and numbers. For instance, we used to grow fancy pelargoniums three and four feet in diameter, but we found we either had to grow smaller specimens or reduce the variety of our collections. This, then, determines in the mind of an experienced gardener the composition of his potting mixtures. His aim should be to grow the finest possible specimens in the smallest possible pots and space, and all the cultural details given by the writer in this Cyclopedia have been with this idea in mind.

EDWARD J. CANNING.

SOJA. Consult *Soy Bean* and *Glycine*.

SOLÀNDRA (after Daniel C. Solander, a Swedish naturalist and traveler, 1736–1786). *Solanàceæ.* A genus of about 4 species of woody vines native to tropical America, with simple, entire, shining leaves and large, white, solitary, datura-like flowers: calyx long-tubular, 2–5-cleft; corolla funnel-shaped; tube cylindrical; throat obliquely and widely bell-shaped; lobes broad, imbricated; stamens 5, inserted on the corolla-tube: berry globose, pulpy.

A. *Plant becoming 12–20 ft. high.*

grandiflòra, Sw. Fig. 2335. Lvs. obovate-oblong, acute, glabrous, thick: fls. fragrant; corolla twice as long as the calyx, not contracted at the throat, white or somewhat yellowish. B.M. 1874. G.C. III. 21:272. Gn. 53:1161. J.H. III. 34:123.

AA. *Plant about 2 ft. high, with trailing branches.*

longiflòra, Tussac (*S. lævis*, Hook.). Lvs. oblong-ovate or obovate, acute; petioles purplish: fls. fragrant; corolla usually 1 ft. long, three times as long as the calyx, contracted at the throat, white or somewhat yellowish. B.M. 4345.—Cult. in S. Calif.

S. guttàta, D. Don, has bright yellow fls. with streaks of purple in the throat and is longer and more slender than *S. grandiflora* and the lobes are more conspicuously fringed. Mex. B.R. 18:1551.

F. W. BARCLAY.

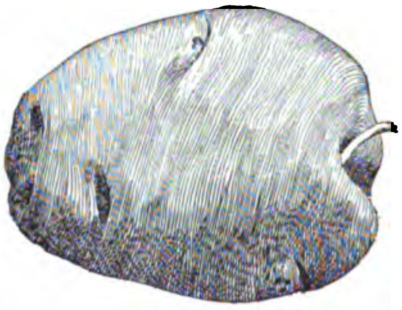
Solandras are attractive plants and their needs are simple. A warm greenhouse—one in which the temperature is never allowed to fall below 50°—will suit them very well in the eastern states. The plants would probably do well outdoors in Florida and the far South. They like plenty of light and sunshine at all seasons of the year, and water should be given freely from early autumn till the latter part of spring, as they make their growth and bloom during that period. In summer, when the wood is ripening, a dry state is preferable for them. The soil that gives the most satisfactory results is a good, somewhat sandy loam. It is unwise to disturb the roots of established plants more frequently than is necessary. The chief point in growing Solandras is to obtain short, sturdy branches, for those of rank growth seldom or never develop flowers; for this reason the use of rich soils and strong fertilizers should be avoided always. Propagated by cuttings of firm young shoots taken with a heel and placed in slight bottom heat.

Solandra grandiflora is perhaps the best of the genus. The flowers do not last more than four or five days. They are of a pretty greenish white color when they first open and turn slowly to a rich brownish yellow

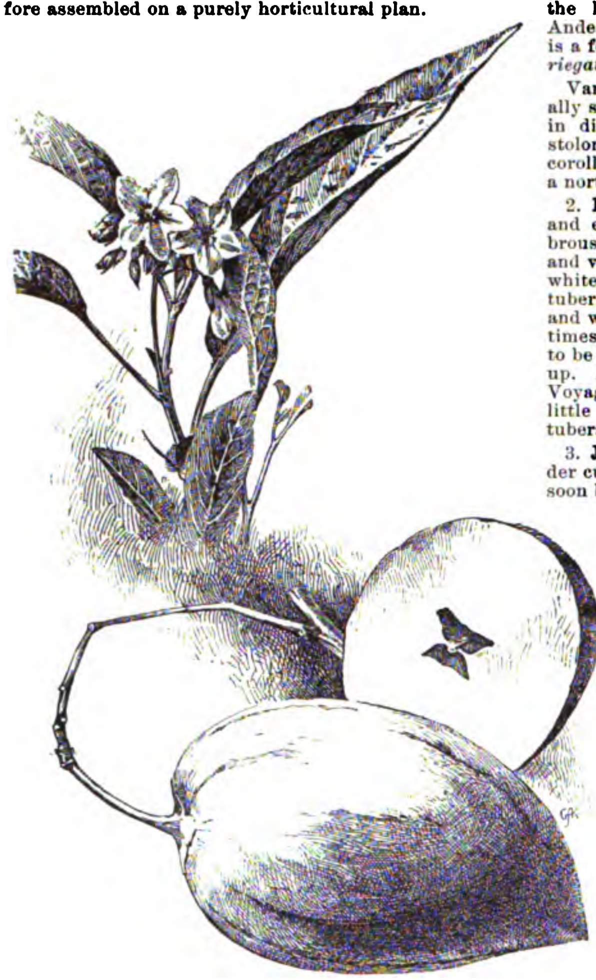
MICHAEL BARKER.

SOLÀNUM (Latin, *solamen*, solace or quieting). NIGHTSHADE. Solanum, giving name to the family *Solanàceæ*, is a vast genus of temperate and tropical herbs, shrubs and even trees, but is comparatively poorly represented in temperate North America. Dunal, the latest monographer (DC. Prodr. 13, pt. 1), in 1852, recognized 901 species, and many species have been described since that time. The genus finds its greatest extension in tropical America. Of the vast number of species, barely 25 are of much account horticulturally, and half that number will comprise all the species that are popularly well known. One of these is the Potato, *Solanum tuberosum*, one of the leading food plants of the human race. The genus seems to abound in plants with toxic properties, although its bad reputation in this respect is probably exaggerated.

As a genus, Solanum is not easily separated from other genera, but some of its most designative characters are as follows: Lvs. alternate: inflorescence mostly sympodial and therefore superaxillary or opposite the lvs.: corolla gamopetalous and rotate or shallow-campanulate, plaited in the bud, the limb angled or shallow-lobed; stamens usually 5, inserted on the throat of the corolla, the anthers narrower or elongated and connivent and mostly opening by an apical pore or slit: ovary usually 2-loculed, ripening into a berry which is sometimes inclosed in the persistent calyx. The fls.


2336. Tuber of Potato—Solanum tuberosum (× ½).

are white, purple or yellow. The species are herbs in temperate climates, but in warm countries many of them are shrubby and some are small trees. Many of them are climbers. It is impracticable to distribute the few cultivated species into the various botanical groups of a great genus, and the following species are therefore assembled on a purely horticultural plan.



2337. Pepino or Melon Shrub—Solanum muricatum (X ½).

INDEX.

aviculare, 13.
azureum, 21.
boreale, 1.
Capsicastrum, 9.
coccineum, 7.
depressum, 6.
esculentum, 6.
Fendleri, 1.
grandiflorum, 20.
Guatemalense, 5.
Hendersoni, 10.
Indicum, 14.
insanum, 6.
integrifolium, 7.
Jamesii, 3.
jasminoides, 20.
laciniatum, 13.
Maglia, 2.
magnificum, 22.
marginatum, 17.
Melongena, 6.
muricatum, 5.
muticum, 11.
nanum, 8.
nigrum, 4.
ovigerum, 6.
Pseudo-Capsicum, 8.
pyracanthum, 16.
Rantonnetii, 11.
Rantonnei, 11.
robustum, 18.
Seaforthianum, 21.
serpentinum, 6.
Texanum, 7.
Torreyi, 15.
tuberosum, 1.
umbellatum, 12.
umbelliferum, 12.
variegatum, 1, 9, 20.
venustum, 21.
Warscewiczii, 19
warscewiczioides, 19.
Weatherilli, 8.
Wendlandii, 22.

A. *Species bearing underground tubers: lvs. pinnate.* (See Baker, Journ. Linn. Soc. 21, for account of the tuberiferous Solanums.)

1. **tuberòsum**, Linn. POTATO. Figs. 1929, 1930; 2336. Low, weak-stemmed, much-branched perennial with tender, herbaceous tops, and perpetuating itself asexually by means of thickened or tuberous underground stems, glabrous or pubescent-hirsute: lvs. unequally pinnate, the 5–9 oblong-ovate lfts. interposed with much smaller ones: fls. lilac or white, in long-stemmed dichotomous clusters, the corolla prominently lobed: fr. a small globular yellow berry, usually not produced in the highly developed modern varieties. Temperate Andes of Chile and adjacent regions.—See *Potato*. There is a form with yellow-blotched lvs. (known as var. *variegatum*) sometimes cult. for ornament.

Var. **boreàle**, Gray (*S. Féndleri*, Gray). Plant usually smaller, as also the tubers, which are about ½ in. in diam. and send off long, creeping subterranean stolons: interposed lfts. one or two or even none: corolla angled. Mts., S. Colo. to Mex.—Apparently only a northward extension of the species.

2. **Máglia**, Schlecht. DARWIN POTATO. More slender and erect than *S. tuberosum* and nearly or quite glabrous: lfts. usually smaller, the interposed ones few and very small: fls. smaller than those of *S. tuberosum*, white, slender-pediceled, in loose, long-forked cymes: tubers small (2 in. or less long), globose or oblong, soft and watery. Coast region of Chile. B.M. 6756.—Sometimes cult. as a curiosity. It has been thought by some to be the original of the Potato, but this is now given up. Darwin describes the plant in his "Naturalist's Voyage." As grown by the writer, the plant has given little promise in the production of tubers, for the tubers are small and soft.

3. **Jàmesii**, Torr. Low and slender, 12–18 in. tall under cultivation, the small angular branches glabrous or soon becoming so: lvs. oblong in general outline, the rachis narrow-winged, the lfts. 5–9, with no interposed small ones, small and lanceolate-oblong in shape: fls. small, white, the corolla deeply cleft and the anthers large and prominent: tubers few, globular, hard, 1 in. or less in diameter, withstanding frost. Mts. of Colo., N. Mex. and Ariz. B. M. 6766.—Sometimes cult. as a curiosity. The tubers do not appear to be eaten.

AA. *Species grown (or collected) for the edible fruits: lvs. simple.*

4. **nigrum**, Linn. BLACK NIGHTSHADE. MORELLE of the French. Annual, 1–2 ft., branching, glabrous or nearly so: lvs. simple and entire, ovate to cuneate-ovate, pointed, long-stalked: fls. white, small, in few-fld. clusters, the pedicels drooping: fr. globular, black, size of a pea.—A widespread weedy plant. In the Dakotas, according to Hansen, the plant is often called "Stubbleberry," as it volunteers freely in wheat stubble, and the fruit is much used there for pies and preserves. Hansen finds that the plants withstand considerable frost. In warm countries, according to Vilmorin, the leaves are sometimes eaten as spinach is, "and apparently without any injurious result, although the plant belongs to the dangerous family of the Solanaceæ." The writer has grown the plant from French seeds, but he does not know that it is in the American trade. The species is exceedingly variable. Gray thinks that the species should include "many and perhaps most of 50 and more species of Dunal in the Prodromus, weeds or weedy plants, widely diffused over the world, especially in the warmer portions."

5. **muricàtum**, Ait. (*S. Guatemalénse*, Hort.). PEPINO. MELON PEAR. MELON SHRUB. Fig. 2337. Erect bushy herb or subshrub, not spiny, glabrous or nearly so: lvs. long and narrow, mostly oblong-lanceolate, tapering to the petiole and also to the nearly or quite obtuse point, the margin wholly entire or somewhat undulate: fls. rather small, bright blue, deeply 5-lobed, inclined or nodding in a long-stalked forking cluster: fr. long-ovoid or egg-shaped, long-stalked, yellow overlaid with streaks and splashes of violet-purple, in cult. specimens 4–6 in. long and seedless. Trop. Amer., at temperate elevations. G.F. 5:173. G.C. III. 3:309.—This plant attracted some attention in this country about ten years ago. It appears to have been introduced into the United

States from Guatemala in 1882 by Gustav Eisen. A full review of the history and botany was made in Cornell Exp. Bull. 37 (1891). The fruit is aromatic, tender and juicy, and in taste suggests an acid eggplant. In a drawer or box, the fruit may be kept till midwinter. In the North the seasons are too short to allow the fruit to mature in the open, unless the plants are started very early. The Pepino is properly a cool-season plant, and when grown in pots in a cool or intermediate house will set its fruits freely. It is readily propagated by means of cuttings of the growing shoots. The plant will withstand a little frost.

6. **Melongèna,** Linn. (*S. insànum*, Linn.). Erect and much-branched herb or subshrub, 2–3 ft. tall, woolly or scurfy, spiny: lvs. large and heavy, ovate or oblong-ovate, becoming nearly glabrous above but remaining densely tomentose beneath, shallowly sinuate-lobed: fls. large, mostly in clusters, the calyx woolly and often spiny, the spreading, deeply lobed, purplish corolla 1 in. or more across: fr. a large berry. India.

Var. **esculéntum,** Nees (*S. esculéntum* and *S. ovigerum*, Dun.). COMMON EGGPLANT. GUINEA SQUASH. AUBERGINE. Figs. 750–753, 830, Vol. II. Cultivated for its large fruits, which are usually oblong, obovoid or egg-shape in form, and purple, white, yellowish or striped: differs from the wild plant in having fewer spines, mostly solitary fls., and much larger and more variable fruits. There are two well-marked subvarieties: var. **serpentinum,** Bailey (*S. serpentìnum*, Desf.). SNAKE EGGPLANT. Fr. greatly elongated and curled at the end.

Var. **depréssum,** Bailey. DWARF PURPLE EGGPLANT. Fig. 754. Plant low and diffuse, many of the branches finally resting on the ground, usually dark-colored, nearly glabrous and always spiny: lvs. small and relatively thin, less lobed: fls. small and longer-stalked: fr. purple, pyriform. See *Eggplant.*

AAA. *Species grown wholly for ornament or curiosity.*

B. *For the fruit alone.*

7. **integrifòlium,** Poir. (*S. Texànum*, Dunal. *S. coccíneum*, Hort.). CHINESE SCARLET EGGPLANT. ORNAMENTAL EGGPLANT. ETHIOPIAN EGGPLANT. Fig. 2338. Coarse, bushy herb, 3 ft. tall, scurfy-tomentose, armed with strong hooked spines: lvs. much like those of the eggplant but the lobes sharper, spiny on the midrib and petiole: fls. small, white, in clusters of 2–6: fr. 1-2 in. across, mostly flattened on the ends but sometimes nearly globular in outline, prominently lobed, bright scarlet or yellow. Probably African.—An old-time garden plant, but little grown. Annual.

BB. *For foliage or flowers (Nos. 8 to 11 also for fruit).*

C. *Habit erect, the plant either herbaceous or woody.*

D. *Plant without spines, mostly with rather narrow lvs.*

E. *Lvs. entire or very nearly so.*

8. **Pseùdo-Cápsicum,** Linn. JERUSALEM CHERRY. Figs. 2339, 2340. Small shrub, reaching 3–4 ft., but usually grown as smaller specimens in pots, glabrous, erect: lvs. lance-oblong to oblanceolate, mostly obtuse, entire or somewhat wavy, shining green, strongly penniveined: fls. few or solitary in lateral clusters, small, white, the corolla 5-parted: fr. globular, ½–¾ in. in diam., scarlet or yellow. Tropics, probably native to Old World.—An old-fashioned plant, often seen in window-gardens, grown for its showy berry-like fruits, which persist a long time. Var. **nànum,** Hort., is a dwarf, compact form. Var **Weàtherilli,** Hort., Weatherill's Hybrid, is a form with strongly veined undulate lvs. and pointed orange-colored fruits.

9. **Capsicástrum,** Link. Fig. 2341. Resembles the last, but the plant attains only about half the size: lvs. much shorter, ovate-lanceolate to oblong-lanceolate, scarcely undulate, subopposite and one smaller than the other: fls. white, in short racemes: fr. ½ in. or less in diam., orange-red or scarlet. Brazil. F.S. 12:1242.—Frequent greenhouse and window plant. Var. **variegàtum,** Hort., has variegated lvs.

10. **Héndersoni,** Hort. Very like *S. Pseudo-Capsicum*, but the white fls. very numerous, and the fr. ovoid or olive-form, orange-red. A horticultural form, perhaps a hybrid. Also known as *S. hybridum Hendersoni.*

11. **Rantonnètii,** Carr. (Variously spelled *S. Rantonnei*, *Rantonetii*, *Rantouni*, etc.) Erect, bushy plant, growing 3–5 ft. tall, glabrous: lvs. lance-ovate, entire, alternate: fls. large, violet-blue, 2–5 together in the axils: fr. 1 in. or less in diam., red, very ornamental, drooping. Paraguay and Argentina. R.H. 1859, p. 135.—*R. mùticum*, N. E. Br., is probably the same. Gt. 43:1401. An excellent plant for blooming in the open in summer. Easily prop. by means of cuttings.

2338. Solanum integrifolium (× ⅙).
A species grown for its ornamental fruit.

12. **umbellìferum,** Eschsch. Perennial, shrubby at the base, hoary-pubescent or sometimes almost glabrous: lvs. obovate-oblong, varying from obtuse to acute: fls. violet-blue (or sometimes white), in umbel-like clusters, ¾ in. across, showy and fragrant. Calif. Variable.—*S. umbellatum*, recently offered, is very likely this species.

EE. *Lvs. prominently lobed.*

13. **aviculàre,** Forst. (*S. laciniàtum*, Ait.). Strong, erect herb or subshrub, 4–6 ft., glabrous: lvs. large, pinnatifid into long nearly linear or lanceolate acute lobes: fls. blue, 1 in. or less across, the corolla prominently lobed, showy: fr. oval or globular, varying from green to orange-red, about ¾–1 in. in diam. (said to be eaten in New Zealand). Australia and New Zealand. B.M. 349.

DD. *Plant more or less spiny: grown for the mass effect.*

E. *Flowers mainly blue.*

14. **Indicum,** Linn. Strong shrub, sometimes taller than a man, with many stout often recurved prickles,

more or less hairy: lvs. ovate, sinuate or lobed, woolly beneath, usually prickly: fls. blue, 1 in. or less across, triangular-lobed: berry globular, about ½ in. in diam., smooth, yellow. Tropical India, and in China and the Philippines.—Offered by Franceschi, S. Calif., who describes the fls. as white. Variable.

15. **Tórreyi**, Gray. Strong perennial herb, with close grayish pubescence and scattering weak prickles: lvs. ovate, with subcordate or truncate base, with 5–7 sinuate lobes, the midrib prickly beneath: fls. few in the cymes, nodding, 2 in. across, pale blue, deeply pointed-lobed, handsome: berry 1 in. in diam., globular, smooth, yellow. Kans. to Tex. B.M. 6461.

16. **pyracánthum**, Jacq. Small shrub, somewhat hairy, thickly beset with ferocious orange spines: lvs. long and relatively narrow, pinnately irregularly lobed: fls. blue, with radiating white ribs, deeply lobed, about 1 in. across, drooping in small clusters: fr. globose, ½ in. or less in diam. Trop. Afr. B.M. 2547. F.S. 23:2411.

EE. *Fls. mainly white.*

17. **marginàtum**, Linn. f. Shrubby, 3–5 ft. tall, white-tomentose, bearing many straight but not very large prickles: lvs. mostly ovate in outline, subcordate, shallow-lobed or angled, at some stages with an irregular white band along the margin due to the shedding of the tomentum on the body of the leaf (whence the name *marginatum*): fls. large, 1 in. or more across, white with blue veins or ribs, shallow-lobed, in few-fld. clusters, the calyx prickly: fr. 1 in. or more in diam., globose or ovoid, drooping, prickly, yellow. Trop. Afr. B.M. 1928.

18. **robústum**, H. Wendl. Vigorous herb or subshrub, 3–5 ft., densely tomentose, prickly on stems and lvs., the stems winged: lvs. very large, sometimes 1 ft. long, broad-ovate or ovate-elliptic in outline, with many pointed angular lobes extending one-third or less the depth of the blade, woolly beneath: fls. white, about 1 in. across, lobed, racemose: fr. globular, small, hairy, orange-colored. Brazil. R.H. 1863, p. 250; 1896, p. 236.—Bold species, useful for subtropical gardening.

2339. Solanum Pseudo-Capsicum (× ½). No. 8.

19. **Warscewiczii**, Weick (*S. warscewiczioides*, Hort.). Strong, erect plant, 3–4 ft., usually with a strong central stem, densely rusty-tomentose and armed with many short stout hooked or straight spines: lvs. large, the blade often more than 1 ft. long, rather soft, tomentose or densely pubescent beneath, deeply several-lobed: fls. large, about 1½ in. across, white, numerous: fr. glabrous and shining, pale yellow. Probably South American. R.H. 1865, p. 430; 1896, p. 237.—A very striking plant for subtropical gardening and easily raised from seed in a single season; half-hardy perennial.

2340.
Solanum Pseudo-Capsicum, the Jerusalem Cherry (× ½).

2341.
Solanum Capsicastrum. (× ½.) No. 9.

CC. *Habit of plant climbing, more or less woody, spineless (except No. 22).*

D. *Fls. small, 1½ in. or less across.*

20. **jasminoides**, Paxt. POTATO VINE (from the fls.). Fine greenhouse twining shrub, reaching several ft. in height, glabrous: lvs. rather small, the upper ones lanceolate to lance-ovate and entire, the lower ones of about 3 narrow, ovate entire lfts.: racemes short and united into a cluster 3 in. or less long and about 8–12-fld.: fls. about 1 in. across, star-shaped, white with tinge of blue; pretty. S. America. P.M. 8:5. B.R. 33:33. Gn. 43, p. 433; 45, p. 162; 50, p. 19; 51, p. 358; 53, p. 28.—A most useful deciduous climber for the coolhouse, and much grown. Half-hardy, and useful for the open in the South. Will grow 10–20 ft. if given a chance. Var. **grandiflòrum**, Hort., has very large trusses of fls. and is a robust grower; excellent. Gng. 1:259. Var. **variegàtum**, Hort., has variegated foliage.

21. **Seaforthiànum**, Andr. (*S. azùreum*, Hort. ? *S. venùstum*, Kunth). Beautiful slender climber or trailer, 4–10 ft., minutely pubescent: lvs. with 3 lfts. (terminal one largest) or the upper ones simple, the margin entire, the lfts. ovate-lanceolate: fls. many in long, drooping panicles, on pedicels swollen at the apex, the corolla mauve or azure-blue, star-shaped, usually 1 in. or less across: fr. ovoid, glabrous, scarlet. Brazil. B.M. 1982, 5823. B.R. 12:969. R.H. 1893, p. 177; 1897:424.—A very beautiful plant for the coolhouse. Begins to bloom when very young.

DD. *Fls. large, 2 in. or more across.*

22. **Wéndlandii**, Hook. f. (*S. Wéndlandii magnificum*, Hort.). Fig. 2342. Tall-climbing, glabrous, with a few scattered prickles: lvs. various, sometimes 10 in. long, the uppermost simple and oblong-acuminate, the others lobed or trifoliolate and with the terminal leaflet much the largest, all with entire margins: fls. in large cymes, pale lilac-blue, the corolla 2½ in. across and shallow-lobed: fr. globose. Costa Rica. B.M. 6914. G.C. III. 14:339. G.M. 36:610. A.F. 12:1147. F.E. 8:828.—A splendid greenhouse climber, perhaps the most showy of the cultivated Solanums. Blooms in summer and fall. Ernest Braunton writes: "*S. Wendlandii* is a magnificent climber in this climate (Los Angeles), reaching 50 ft. or more and having umbels 12 inches across. It is perhaps the showiest vine in California when in bloom. It is generally hardy here, although some winters nip and even kill the vine in the colder and lower parts of this city. Cut up an old vine, any kind of wood, stick the pieces in sand or light soil,

and wait. Every cutting will grow. When in a robust condition it is a gross feeder. It should be in the full sun, though it does well anywhere."

S. betàceum, Cav., is Cyphomandra, for which see Vol. I.—*S. cérnuum*, Velloz., is a shrub or small tree, with cyphomandra-like lvs. and the young parts clothed with chaffy hairs: fls. white: fr. globose, hairy, inclosed in the calyx. S. Brazil. B.M. 7491.—*S. ciliàtum*, Lam. Stout herb or subshrub, 1-2 ft. tall, with prickly stems and ovate acute-lobed lvs.: fls. white, 1 in. or less across: fr. 2 in. or more across, flattened on the ends, corrugated, scarlet, showy. Porto Rico. F.S. 19:1988. F.M. 1871:521. R.B. 20, p. 249. R.H. 1888, p. 78., Perhaps a form of S. aculeatissimum, Jacq.—*S. cornùtum*, Lam. (S. Fontanesianum, Hort.). Annual, 1-2 ft., very spiny, with pinnatifid lvs., the lobes again lobed and obtuse; fls. golden yellow: fr. small, spiny. Mex. G.C. III. 22:311.—*S. críspum*, Ruiz & Pav. Erect or half-climbing woody shrub, with simple ovate-oblong entire or undulate lvs., and large clusters of pale purple red-ribbed fls. an inch across. Chile. B.M. 3795. B.R. 18:1516. L.B.C. 20:1959. Gn. 44:919; 51, p. 230. Half-hardy very beautiful climber.—*S. Dulcamàra*, Linn. BITTERSWEET. Scrambling vine of the Old World, but naturalized about dwellings and along roads and even in swamps: lvs. cordate-ovate, some of them ear-lobed at the base: fls. small, nodding, star-like, blue, succeeded by showy oblong red shining berries.—*S. pénsile*, Sendt. Climber, allied to S. Dulcamara: lvs. cordate-ovate, simple and entire: fls. blue, 1 in. across, deeply lobed, in loug panicles or racemes: berry globose, size of a pea, purple. Guiana and the Amazon. B.M. 7062.—"*S. Pierreanum*. South America. Very interesting and pretty for its fruits striped different colors." *Franceschi*.

L. H. B.

2342. Solanum Wendlandii. Much reduced.

SOLDANÉLLA (Latin, *a small coin;* referring to the shape of the lvs.). *Primulàceæ*. About 4 species of alpine plants 2-3 in. high, with nodding, funnel-shaped, fringed flowers of violet or purplish blue, and about ½-¾ in. across. Soldanellas are amongst the most famous flowers of the Alps, though not the commonest. *S. alpina* ascends the mountains to the line of perpetual snow. Grant Allen, in "Flashlights on Nature," declares that the flower of Soldanella actually thaws its way up through a solid block of ice. Soldanellas are cultivated in this country only in a few large rock gardens. Those who have limited resources and dwell in the region of changeable winters might attempt to grow these plants in pots under a frame in lieu of nature's winter covering. According to J. B. Keller, they prefer a half-shady or shady position and are prop. by seed or division.

Soldanellas are native only to the Alps of middle Europe. They are slender, glabrous, perennial herbs, with short rhizomes: lvs. long-stalked, thick, roundish, with a heart-shaped or kidney-shaped base, entire: scapes slender, solitary or few, about 6 in. high or less: calyx 5-parted; corolla 5-cut. The descriptions of the species are here adopted from Koch's Synopsis Floræ Germanicæ. Some white-flowered forms have been recorded.

A. *Fls. 2-4 on a scape: corolla split half way to the base; filaments half as long as anthers.*

B. *Pedicels pubescent.*

montàna, Willd. Lvs. roundish: margin slightly and remotely crenate: fls. violet. May-July.

BB. *Pedicels roughish.*

alpina, Linn. Fig. 2343. Lvs. roundish; base more or less kidney-shaped; margin entire or somewhat wavy: fls. violet, with darker streaks. May. B.M. 49. G.C. II. 24:457.

AA. *Fls. solitary: corolla split a third of the way to the base: filaments about as long as anthers.*

B. *Pedicels roughish.*

pusilla, Baumg. Base of lvs. heart-shaped or kidney-shaped; margin somewhat wavy: fls. copper-colored, verging on blue, the fringes straight, not spreading. May.

BB. *Pedicels pubescent.*

minima, Hoppe. Lvs. roundish: fls pale lilac, streaked purple inside; the fringes spreading at the tips. June, July.

W. M.

SÒLEA (after W. Sole, author of a monograph of the mints of England). *Violàceæ*. A single species native to the eastern U. S., an herbaceous perennial 1-2 ft. high, with mostly oblong, narrowly acuminate leaves 3-5 in. long, and small nodding greenish flowers solitary or in pairs in many of the leaf-axils: sepals linear and equal; petals nearly equal, connivent nearly their entire length, the lower one much larger, saccate at the base, emarginate at the broad apex; stamens with broad connectives wholly connate into an ovoid sac open only between the free tips, a rounded or 2-lobed scale-like gland adnate to the base anteriorly.

cóncolor, Ging. (*Ionídium cóncolor*, Benth. & Hook.). May, June. Moist woods. B.B. 2:456.—Is offered by collectors.

F. W. BARCLAY.

SOLENÁNTHUS (Greek, *tube* and *flower;* referring to the form of the corolla). *Borraginàceæ*. About 15 species of perennial herbs from Europe and Asia with alternate leaves and blue or rosy flowers either in long, simple, bracted racemes or in shorter, bractless, scirpioid, panicled racemes: calyx 5-parted; segments narrow, but little enlarged in fruit; corolla tubular, the lobes short, erect or somewhat spreading; stamens exserted: ovary-lobes 4, distinct: nutlets 4.

2343. Soldanella alpina (× ½).

Apenninus, Hohen. (*Cynoglóssum Apenninum*, Linn.). Plant hardy, 2½–3 ft. high: lvs. rather coarse, the radical ovate-oblong, those of the stem long-lanceolate: fls. blue, forget-me-not-like, in dense, axillary, panicled racemes. May, June. S. Europe.—A useful plant amongst shrubbery or in the back part of borders. Prop. by division or seed. F. W. BARCLAY.

SOLIDÀGO (according to Gray, from "*solidus* and *ago*, to make solid or draw together, in allusion to reputed vulnerary properties"). *Compósitæ.* GOLDENROD. Amongst the glories of the American autumn are the asters and Goldenrods. They complement each other. The asters run in cyanic colors, Goldenrods in xanthic,—the blue and blush on the one hand and the yellow and golden on the other. Because the Goldenrods are so common, they have not been appreciated for planting. They improve in the garden, however, the plants becoming larger and the bloom fuller and richer. They present no difficulties in cultivation. They may be transplanted from the wild with the greatest ease, and the stools may be lifted and divided as soon as they become root-bound and show signs of failing. The Solidagos are variable, even within the same species. Therefore it is well to mark fine individual clumps when in bloom, for removal in late fall or early spring. The observation of a single season should result in a fine collection of individual plants; and the natural excellences of these specimens should be maintained and augmented by supplying good soil and giving good care. Too often it is thought that because the plants thrive under poor conditions in the wild, they do not profit by superior conditions in the garden; but this is an error.

Solidagos are erect perennial herbs with simple alternate leaves, and many small yellow (rarely whitish) heads in spikes, thyrses, compound panicles, or racemes. The heads are oblong or narrow-campanulate, with small, mostly appressed scales, containing few florets, the disk-florets all perfect and the ray-florets in one series and pistillate. The pappus is composed of 1 or 2 rows of roughish capillary bristles. The genus is characteristic of eastern North America, where about 60 species occur. There are several species on the Pacific coast, a few in Mexico and South America, and two or three in Europe and northern Asia, making, altogether, nearly 100 species.

None of the species are well known in the trade, although any of them may be expected to appear in the catalogues of dealers in native and hardy plants. For descriptions of the species, see Gray's Syn. Fl. N. Amer., vol. 1, pt. 2; for the species of the northeastern states, also Gray's Manual and Britton & Brown's Flora. The following have been offered by American dealers:

bicolor, Linn.
cæsia, Linn., Fig. 2344.
Canadensis, Linn., Fig. 2345.
— var. procera, Torr. & Gray.
Drummondii, Torr. & Gray.
elongata, Nutt.
confertiflora, DC.
juncea, Ait.
lanceolata, Linn.
latifolia, Linn.
Missouriensis, Nutt.
neglecta, Torr. & Gray.
nemoralis, Ait., Fig. 2346.
occidentalis, Nutt.
odora, Ait.
Ohioensis, Ridd.
patula, Muhl.
petiolaris, Ait.
puberula, Nutt.
Riddellii, Frank.
rigida, Linn.
rigidiuscula, Porter.
rugosa, Mill., Fig. 2347.
sempervirens, Linn.
serotina, Ait.
— var. gigantea, Gray.
Shortii, Torr. & Gray.
speciosa, Nutt.
spectabilis, Gray.
stricta, Ait.
uliginosa, Nutt.
ulmifolia, Muhl.
Virgaurea, var. alpina, Bigel.

L. H. B.

SÓLLYA (in honor of Richard Horsman Solly, 1778–1858, an English botanist). *Pittosporàceæ.* Two species of Australian evergreen twining plants: lvs. narrow: fls. nodding, on slender pedicels, solitary or in loose, few-flowered cymes; sepals distinct, small; petals obovate, spreading from the base; anthers connivent in a cone around the pistil: capsule many-seeded. Propagated by cuttings in sand under glass, or by seeds, which germinate readily.

heterophýlla, Lindl. AUSTRALIAN BLUEBELL CREEPER. Small shrub, 2–6 ft. high, with slender, twining stems: lvs. variable, from lanceolate or oblong-linear to ovate-lanceolate or ovate-oblong, obtuse or slightly acuminate, entire, 1–2 in. long, usually narrowed into short petioles: cymes 4–8–12-fld., terminal or leaf opposed: fls. bright blue, ⅛–½ in. long. July. B.M. 3523. R.B. 21:253. B.R. 17:1466.—Hardy and much cultivated in middle California and a great favorite on account of the brilliant blue of its flowers. Especially valuable for covering banks, rockwork and low fences, preferring to scramble over other plants. Also grown as an herbaceous border plant, being kept within bounds by the shears. The roots are very attractive to the California pocket-gopher, who plays sad havoc with it if not watched. J. BURTT DAVY.

SOLOMON'S SEAL. *Polygonatum.*

SOLOMON'S SEAL, FALSE. *Smilacina.*

SONERÌLA (adapted from a native name). *Melastomàceæ.* This includes a number of dwarf, tender foliage plants which must be grown in the greenhouse all the year round. The plants belong to the same cultural group with Bertolonia, Gravesia, and Monolena and are distinguished by having their floral parts in 3's. There are about 70 species, all natives of India and the Malay archipelago. The fls. are usually rose-colored, ½ in. across or less, and generally disposed in scorpioid racemes or spikes. The genus is monographed in Latin by Cogniaux in DC. Mon. Phaner. vol. 7 (1891). The species described below are all caulescent plants with lvs. distinctly petioled, those of each pair being of equal size (except in *S. maculata*): fls. 3-merous; stamens 3, long-acuminate.

2344. Solidago cæsia

Sonerilas are highly esteemed in Belgium, where they have been developed by Van Houtte, Linden, Van Gaert and others. At present only 8 names are found in the American trade, as follows: *S. argentea*, *Hendersoni*, *marmorata*, *margaritacea alba*, *orientalis*, *picturata*, *picta* and *punctata*. A satisfactory explanation of these names involves a number of others mentioned below. In addition there are about 15 kinds with personal names that vary from the types mentioned below in their variegation. There are also some hybrids between Sonerila and Bertolonia which are known to the trade as Bertonerila. The most important of the species mentioned below is *S. margaritacea*.

It was long thought impossible to grow Sonerila and its allies outside of a bell-jar or Wardian case. The Belgians now dispense with the "double glass" and grow these plants in tropical or even temperate greenhouses. For potting material they use a compost of

fibrous peat and chopped sphagnum, sprinkled with sand and interspersed with bits of charcoal. The plants should have a partially shaded position, and should never be syringed. Never allow water to remain on the leaves. The species seed freely. The varieties are propagated by division.
W. M.

Sonerilas thrive best in a close and moisture-laden atmosphere with just enough ventilation to keep them from melting or decaying. A temperature of not less than 75° suits them best. Cuttings of well-ripened growth are placed under a glass case or bell-glass in a bottom heat of 70–80°. Care must be taken every morning to allow the drops of condensation which gather on the glass to dissipate. For potting material use fine-screened leaf-mold, with plenty of silver sand intermixed and a little finely chopped fresh sphagnum on the top of the pots or pans. These plants have shallow roots, and require plenty of drainage, consisting of fine broken potsherds mixed with either charcoal or finely ground soft-coal clinkers. When the plants have made their full growth (which they do if started at the proper time in early spring) they start into flower. At this time the plants should be hardened off by gradually withholding water, and they should also be kept a little cooler. When fully ripened they may be cut back in order to furnish material for cuttings. Keep the old stools a little warmer and they will gradually start into new growth again. These plants make choice decorative plants in pans or even in wire baskets and can be used for choice table or mantel decorations.
H. A. Siebrecht.

2345. Solidago Canadensis.

2346. Solidago nemoralis.

2347. Solidago rugosa.

INDEX.

argentea, 7.
guttulata, 4.
Hendersoni 6.
maculata, 2.
Mamei, 6.
margaritacea, 5.
orientalis, 4.
picta, 3, 4.
punctata, 4.
speciosa, 1.

A. *Foliage not variegated* ....1. **speciosa**
AA. *Foliage variegated.*
B. *Calyx has rather long and sparse glandular hairs* ....2. **maculata**
BB. *Calyx glabrous or rarely dotted-scurfy.*
C. *No. of nerves 7: margin of lvs. minutely serrate*............3. **picta**
CC. *No. of nerves 9 or 7: margin of lvs. sharply and prominently serrate.*
D. *Color of nerves dark purple: lvs. covered with short, dark purple hairs* ....4. **orientalis**
DD. *Color of nerves green: lvs. glandular-pubescent, the pubescence not purplish.*
E. *Lvs. with a dark green ground, and pearl-like spots of regular size and arrangement* .....5. **margaritacea**
EE. *Lvs. with a dark green ground, and irregular light-colored blotches between the veins* .....6. **Hendersoni**
EEE. *Lvs. silvery, only the nerves dark green* ....7. **argentea**

1. **speciòsa**, Zenker. This is practically the only species cult. for its flowers: height 1 ft.: lvs. opposite, cordate-ovate, green above, sometimes crimson beneath, mostly 7–9-nerved: fls. purple or rose, 4–14 in a cluster, 1 in. across. India. B.M. 5026; 4978 (*S. elegans*). F.S. 23:2442.

2. **maculàta**, Roxb. This differs from the other species here described in having lvs. of unequal sizes. The larger one of each pair may be 3–5 in. long; the smaller a half or third as long: lvs. ovate or oblong, unequal at the base, minutely denticulate, 9–11-nerved: fls. violet. India. R.H. 1865, p. 91, is too poor to determine.—Probably not in cult.

3. **picta**, Korth. Erect or ascending, with scurfy or puberulous branches: lvs. short-petioled, broadly lanceolate, wedge-shaped at the base, minutely serrate, 7-nerved, lined with white along the primary nerves: fls. rosy. Sumatra.—*S. picta* of the trade is probably *S. orientalis*, var. *picta*.

4. **orientàlis**, Linden. The botanical status of this name is doubtful. In horticulture it applies to a group of varieties sent out by Wm. Bull in 1891, and remarkable for two novel features: some of the varieties have dark purple or bronzy colors; others are peppered all over with an infinite number of small, light-colored dots. All have dark purple nerves. In I.H. 37:113 the lvs. are shown as ovate, acuminate, more or less cordate and unequal at the base, with 9 or 10 nerves, entire: color of fls. not recorded. Habitat not stated. The typical form is said to have bronzy lvs. with an amaranth reverse. Var. **guttulàta** has green lvs. peppered

with small white dots and is pale green below. Var. **punctàta** is much like the preceding variety but has paler leaves. Var. **picta** has the purplish lvs. of the type, with an irregular lanceolate strip of silvery gray down the middle. Var. Robert Sallier, R.B. 20:61, has dark green lvs. peppered white and with a lanceolate figure of silver down the middle. Said to be a hybrid of vars. *picta* and *punctata*. It has the stripe of one and the dots of the other.

5. **margaritàcea,** Lindl. This is the most important species. The name "margaritacea" means "pearly," referring to the regular rows of pearly spots between the nerves and parallel with them, which are characteristic of the typical form. Lvs. ovate-lanceolate, acutely serrate, 7–9-nerved, glabrous, purplish below, acute at the base: fls. rosy. B.M. 5104. F.S. 11:1126 (nerves too parallel). I.H. 2:40. Lowe 16.—Supposed to be native of Java. In Vol. II of this work, page 684, *Gravesia guttata*, var. *margaritacea*, is erroneously referred to Sonerila instead of Salpinga. *Salpinga margaritacea* is readily told from *Sonerila margaritacea* by its 5-nerved lvs. and floral parts in 5's.

6. **Héndersoni,** Hort. This is referred by Cogniaux to *S. margaritacea*, of which it is perhaps merely a horticultural variety. For trade purposes it is convenient to treat it like a distinct species. It seems to be the chief parent in the development of the numerous hybrids with blotched foliage. It differs from the type in having a broader leaf with a shorter acumen and rounded base, and especially in being covered with irregular blotches, which, however, do not cross the nerves. F.M. 1875:159. I.H. 23:230.—The blotches are all about the same size. *S. Mámei*, Linden, has more regular and roundish blotches, which are nearer white and on a darker ground. The under side is netted with rosy purple. I.H. 23:254.

7. **argéntea,** Hort. (*S. Héndersoni*, var. *argéntea*, Fournier). For horticultural purposes this may be treated as a distinct species, characterized by its silvery foliage, resembling that of certain begonias, with no dark green except on the nerves. This is the parent of most of the forms that have a silvery cast of foliage, just as *S. Hendersoni* is responsible for the irregular blotches. I.H. 23:230.—Sonerila Alp. Van De Sande shows the Hendersoni and argentea blood in the large silvery blotches, most of which are larger than in Hendersoni.

A very handsome hybrid between the orientalis and margaritacea groups is called Mme. Paul du Toict. It has the serrate leaf and some of the silveriness of S. argentea, with the numberless minute dots of the S. orientalis group. It is much like Robert Sallier, but the central coloring is bronzy as well as silvery and more broken up by the green.

S. marmoràta and *picturàta* of Siebrecht cannot be accounted for by the undersigned.

W. M.

SOPHÒRA (*Sophera*, Arabian name of a tree with pea-shaped flowers). Including *Styphnolobium* and *Edwardsia*. *Leguminòsæ*. Ornamental deciduous or evergreen trees or shrubs, sometimes perennials with alternate, odd-pinnate leaves, papilionaceous, yellow, whitish or violet flowers and long and narrow moniliform pods. The best known species, *S. Japonica*, is hardy as far north as Mass., but *S. platycarpa* seems to be somewhat hardier. The evergreen species with large yellow fls. are tender and can be grown only in the southern states and California; they are very showy in spring when they are in bloom; in England they are often planted against a wall, where they can be easily protected against light frost. *S. Japonica* is especially valuable for its late-appearing flowers, which are white and disposed in ample panicles; the foliage is dark green and graceful and the tree is conspicuous in winter on account of its dark green branches. The Sophoras thrive best in well-drained sandy loam but grow fairly well in rather dry soil. Prop. by seeds and the varieties by grafting on the typical form; some species are also increased by greenwood cuttings and by layers.

More than 25 species in the temperate regions of both hemispheres. Trees, shrubs or herbs: lvs. odd-pinnate, with usually opposite small lfts.: fls. papilionaceous, in racemes or terminal leafy panicles; calyx with 5 short teeth; standard orbicular or broadly obovate; stamens 10, free or connate only at the base: pod stalked, almost terete or 4-winged, rarely compressed, few- to many-seeded, moniliform, indehiscent or tardily dehiscent. The fls. and frs. of *S. Japonica* yield a yellow dye, *S. tomentosa* has medical properties, and the seeds of *S. secundiflora* contain sophorine, a poisonous alkaloid. *S. tetraptera* is a valuable timber tree in its native country.

2348. Sophora Japonica, var. pendula, in winter.

INDEX.

(Including names advertised under Edwardsia. S. L. = supplementary list.)

affinis, S. L.
alopecuroides, S. L.
australis, S. L.
Chilensis, 5.
Chinensis, S. L.
chrysophylla, S. L.
grandiflora, 4.
Japonica, 1.
Korolkowi, S. L.
Macnabiana, 4.
macrocarpa, 5.
microphylla, 4.
pendula, 1.
platycarpa, 2.
secundiflora, 3.
tetraptera, 4.
tomentosa, S. L.
violacea, S. L.

A. *Fls. white or violet.*

B. *Lvs. deciduous: fls. in terminal panicles.*

C. *Calyx rounded at the base.*

1. **Japónica,** Linn. (*Styphnolòbium Japónicum*, Schott). JAPAN PAGODA TREE. Tree, attaining 60 ft., with spreading branches, forming a dense round head: lvs. 7–9 in. long; lfts. 5–13, distinctly stalked, ovate to ovate-lanceolate, acute, rounded at base, dark green and glossy above, more or less pubescent beneath, 1–2 in. long: fls. yellowish white, ½ in. long, in loose panicles 15 in. long: pod distinctly stalked, glabrous, terete, 2–3 in. long, ½ in. broad. July–Sept. China; cult. in Japan. Gn. 24, pp. 210, 211, 214; 29, p. 222. G.M. 38:665. Gng. 6, p. 247. M.D.G. 1898:183.—Var. **péndula,** Loud. Figs. 2348, 2349. With long and slender pendulous branches. R.H. 1876:194, 195. Gn. 9, pp. 600, 601; 24, pp. 202, 203, 211; 28, p. 27. M.D.G. 1898:182. The form with variegated lvs. has little to recommend it. There are several allied forms in cultivation probably introduced from E. Asia, of similar appearance and of about the same hardiness; they are yet imperfectly known under provisional names: such are *S. Chinensis*, *Korolkowi*, *tomentosa* and *violacea*, for which see supplementary list. The pictures of the Weeping Sophora (Figs. 2348, 2349) are adapted from Revue Horticole.

CC. *Calyx narrowed into the pedicel.*

2. **platycárpa,** Maxim. Tree, similar in habit to the preceding but with very distinct fr.: lfts. 11–15, alternate, ovate to elliptic-lanceolate, acuminate, glabrous or nearly so, 2–3½ in. long: fls. white, over ½ in. long; calyx gradually narrowed into the short pedicel: pod oblong to oblong-lanceolate, compressed and 2-winged, 1–5-seeded. Japan.—Has proved hardier than *S. Japonica* and is therefore to be recommended for northern regions.

BB. *Lvs. persistent: fls. violet, in terminal racemes.*

3. **secundiflòra,** Lag. Small tree, 35 ft. high, or shrubby, with short, slender trunk and upright branches forming

a narrow head: lvs. 4–6 in. long; lfts. 7–9, elliptic or obovate-oblong to oblong, rounded or emarginate at the apex, cuneate at the base, silky-pubescent when young, dark yellowish green above, 1–2½ in. long: fls. violet-blue, the standard marked near the base with a few dark spots, very fragrant, about 1 in. long, in one-sided racemes 2–3 in. long: pod white-tomentose, terete, 1–7 in. long, ½–¾ in. thick; seed bright scarlet. Spring. Texas to New Mexico. S.S. 3:121. R.H. 1854:201.—On account of its handsome fragrant fls. to be recommended for planting south.

2349. Sophora Japonica, var. pendula, in summer.

AA. *Fls. yellow, in axillary racemes: lvs. evergreen. (Edwardsia.)*

B. *Pod 4-winged: fls. about 1½ in. long.*

4. **tetráptera**, Ait. Shrub or small tree, 30, rarely 40 ft. high, with slender spreading branches: lfts. very numerous, almost sessile, obovate to linear-oblong, silky-pubescent beneath: fls. in 2–8-fld. racemes, pendulous, about 1½ in. long: pod 4-winged, 7 in. long. Spring. New Zealand, Lord Howe Island, Juan Fernandez, Chile.—The following varieties are in cultivation: Var. **grandiflòra**, Hook. f. (*Edwárdsia grandiflòra*, Salisb.). Lfts. linear-oblong, about 1 in. long, in 10–25 pairs: fls. 1⅔ in. long; standard shorter than wings. B.M. 167. G.C. II. 9:729. Gn. 24, p. 211. L.B.C. 12:1162. Var. **microphýlla**, Hook. f. (*Sophòra microphýlla*, Ait. *Edwárdsia Macnabiàna*, Curt.). Lfts. orbicular-obovate to broadly oblong, usually emarginate, ¼–½ in. long: fls. about 1½ in. long; standard about as long as wings. B.M. 1442, 3735. Gn. 24, p. 211. Gn. 12:87 also seems to belong here.

BB. *Pod not winged: fls. ¾–1 in. long.*

5. **macrocárpa**, Smith (*Edwárdsia Chiléensis*, Miers). Shrub or small tree, with the young branchlets densely tomentose: lfts. in 10–20 pairs, elliptic or obovate obtuse, silky-pubescent beneath, ¾–1 in. long: fls. ¾–1 in. long, in short racemes; standard as long as wings: pod terete, not winged, 1–4-seeded. Chile. L.B.C. 12:1125. B.R. 21:1798.

S. affinis, Torr. & Gray. Small, deciduous round-headed tree, 20 ft. high: lfts. 13–19, elliptic-ovate, nearly glabrous, 1-1½ in. long: fls. white, tinged rose, ½ in. long, in slender, axillary racemes: pod terete, black, ½–3 in. long. Spring. Ark., Tex. S.S. 3:122.—*S. alopecuroides*, Linn. Grayish pubescent undershrub, with upright, virgate branches: lvs. 6 in. long, with 15–25 oblong lfts.: fls. yellow: racemes dense, terminal, about 6 in. long: pod terete, 6–12-seeded. W. Asia to Himalayas. Half-hardy.—*S. austràlis*, Linn. = Baptisia australis.—*S. Chinénsis*, Hort. Allied to S. Japonica. Lfts. 11–17, ovate to ovate-oblong, pubescent beneath, ¾–1 in. long: fls. pale pink. Probably from China.—*S. chrysophýlla*, Seem. (Edwardsia chrysophylla, Salisb.). Allied to S. tetraptera: pubescence more golden yellow: lfts. 15–19, obovate, small: fls. smaller: standard shorter than wings. Sandwich Islands. B.R. 9:738.—*S. Korolkòwi*, Hort. Similar to S Japonica: lfts. usually 11, lanceolate, dark green above, pale and appressed pubescent beneath, 1–1¾ in. long: fls. white. Probably from central or eastern Asia.—*S. tomentòsa*, Linn. Pubescent shrub: lvs. 6–10 in. long; lfts. 15-19, oval to oblong, obtuse, 1–1¾ in. long: fls. yellow, in terminal, 6–12-in. long racemes: pod 4–6 in. long. S. states, W. India. B.M. 3390. Not hardy north.—*S. tomentòsa*, Hort., is similar to S. Japonica, but imperfectly known: lfts. 15–21, oval to oblong, pubescent beneath, about 1 in. long. Probably from Asia.—*S. violàcea*, Thwait, is a shrubby species from Ceylon, not in cultivation, but under the same name another imperfectly known species, probably from China, is cult. It has 15–17 oblong, acute lfts., sparingly pubescent above, densely beneath, and pale violet flowers.

ALFRED REHDER.

SÒPHRO-CÁTTLEYA. Orchid hybrids between Sophronitis and Cattleya, little known in America.

SÒPHRO-LÈLIA. Orchid hybrids between Sophronitis and Lælia not advertised in American trade catalogues.

SOPHRONÌTIS (Greek, *modest*). *Orchidàceæ.* A genus of about 4 species cultivated on account of their neat habit and brilliantly colored flowers: pseudobulbs small, with 1 or rarely 2 small flat lvs.: fls. from the top of the pseudobulbs, brightly colored; sepals and petals nearly equal, spreading; labellum with a broad middle lobe and small erect side lobes, the base leading into a cavity in the wall of the ovary; column short, the stigmatic surface covering 2 wing-like projections at its summit; pollinia 8. This genus is closely related to Lælia, Cattleya, etc.

These plants, and also Sophro-Cattleyas and Sophro-Lælias, thrive in the temperature of the Cattleya house. In growing season, give a moderate supply of water and plenty of fresh air. Rest them at 50°–55°, and water sufficiently to keep them from shriveling. Grow them in shallow pots with plenty of drainage, and a thin layer of fine turfy fern root, using no sphagnum.

grandiflòra, Lindl. (*S. coccínea*, Reichb. f.). Pseudobulbs clustered: lvs. about 2 in. long, elliptic: fls. solitary, on short peduncles, 1½–4 in. across, brilliant scarlet, often with a shade of orange, with an orange labellum; sepals oblong-lanceolate; petals broadly elliptic; labellum narrow, with folded sides. Flowers during the whole winter. Organ Mts. B.M. 3709. F.S. 1:22; 17:1716. P.M. 9:193. Gn. 25:443 (var. *rosea*); 31, p. 358; 48:1025. I.H. 34:32. J.H. III. 34:319. G.C. II. 22:561; III. 9:669; III. 17:492; III. 21:266. R.H. 1886:492 (var. *aurantiaca*). A.F. 6:609.

cérnua, Lindl. Very small plants with a creeping rhizome bearing 1-lvd. pseudobulbs: lvs. ovate, thick and leathery, a little over an inch long: fls. 4–8, on a stem from the axils of the lvs., bright scarlet or reddish orange, with an orange lip; sepals and petals ovate; labellum ovate-acuminate, shorter, concave. Winter. Rio Janeiro. B.M. 3677. B.R. 13:1129.

violàcea, Lindl. One of the smallest of cultivated orchids: pseudobulbs ovoid, 1 in. long: lvs. linear, 2–3 in. long: fls. bright rose, about 1 in. in diam.; sepals and petals oblong-lanceolate, acute; labellum rhombie-obovate, flat. Winter. Organ Mts., Brazil. B.M. 6880

HEINRICH HASSELBRING and WM. MATHEWS.

SORBÀRIA (derived from Sorbus: the leaves resemble those of the mountain ash). *Basilima. Rosàceæ.* Ornamental deciduous shrubs with rather large, odd-pinnate or bipinnate leaves and white flowers in terminal showy panicles. *Sorbaria sorbifolia*, *S. alpina* and *S. Aitchisoni* are hardy north, while *S. Lindleyana* is only half-hardy. They are well adapted for borders of shrubberies and woods or for planting on banks of brooks or rivers, but should not be brought together with slow-growing and delicate shrubs, as they spread in suitable soil rather rapidly by means of suckers and are likely to overcrowd other plants. The handsome bright green foliage appears very early in spring. The large white panicles appearing in summer are showy, but become rather unsightly after they have faded and should be removed. The Sorbarias, except *S. Millefolium*, which prefers a rather dry, well-drained soil and sunny position, grow best in a somewhat moist and rich soil and thrive also in partly shaded situations. Prop. by hardwood cuttings; also by root-cuttings, suckers and seeds. Four species in Asia and one in N. America, formerly usually united with Spiræa but easily distinguished by their stipulate, pinnate lvs. and the 5 carpels being opposite to the sepals.

A. *Lvs. pinnate.*

B. *Panicles with upright ramifications, dense.*

C. *Fls. ⅓ in. across.*

sorbifòlia, A. Braun (*Spiræa sorbifòlia*, Linn. *Basilìma sorbifòlia*, Raf.). Fig. 2350. Upright shrub, 3–5 ft. high: lfts. 13–23, lanceolate or ovate-lanceolate, long-acuminate, doubly serrate, stellate-pubescent beneath when young or glabrous, 3–4 in. long: panicles 5–12 in. long: fls. ⅓ in. across. June, July. N. Asia, from Ural to Japan. A.G. 11:125. Gn. 16, p. 217.—Escaped from cultivation in some localities in the Middle States.

2350. **Sorbaria sorbifolia** (× 1-5). Usually known as *Spiræa sorbifolia*.

CC. *Fls. ½ in. across.*

grandiflòra, Maxim. (*Spiræa grandiflòra*, Sweet. *Sp. sorbifòlia*, var. *alpìna*, Pall. *Basilìma alpìna*, Koehne). Shrub, 1–3 ft. high: lfts. 13–17, oblong to lanceolate, acuminate, doubly serrate, glabrous, 2–3 in. long: panicles 3–5 in. long: fls. ½ in. across. June, July. E. Siberia. Gt. 9:295.

BB. *Panicles with spreading ramifications.*

C. *Young branches pubescent, green.*

Lindleyàna, Maxim. (*Spiræa Lindleyàna*, Wall. *Basilìma Lindleyàna*, Kuntze). Four to 8 ft. high: lfts. 15–21, lanceolate, long-acuminate, rounded at the base, doubly serrate, with simple hairs beneath when young, 3–4 in. long: panicles 8–12 in. long and about 8 in. broad: fls. ¼ in. across. July, Aug. Himalayas, China. F.S. 2:108. B.R. 31:33. Gn. 47, p. 222; 49, p. 229; 55, p. 116.

CC. *Young branches glabrous, usually red.*

Aitchisoni, Hemsl. (*Spiræa Aitchisoni*, Hemsl. *S. sorbifòlia*, var. *angustifòlia*, Wenzig). Shrub, 6–8 ft. high, with upright or ascending, little-branched stems, usually bright red when young: lfts. 15–21, lanceolate to linear-lanceolate, acuminate, narrowed at the base, simply or obscurely doubly serrate, glabrous, 2–4 in. long: panicles to 12 in. long, leafy at the base: fls. ⅓ in. or more across. July–Sept. Afghanistan, Cashmere. G.C. III. 28:255. M.D.G. 1901:18.—A very desirable shrub with handsome graceful foliage, much hardier than the preceding species.

AA. *Lvs. bipinnate.*

Millefòlium, Focke (*Spiræa Millefòlium*, Torrey. *Chamæbàtia Millefòlium*, Maxim. *Basilìma Millefòlium*, Kuntze). Aromatic, glandular-pubescent spreading shrub, 2–6 ft. high: lvs. lanceolate in outline, 1–3 in. long. with minute, densely set, oblong and obtuse lfts.: fls. ½ in. across, in 2–5-in. long panicles. July, Aug. Calif. to Wyoming and Arizona. G.F. 2:509. G. C. III. 22:237.—Rarely cult.; it has proved hardy in Mass., but, like other plants from the same region, it is likely to be killed by too much moisture during the winter.

ALFRED REHDER.

SÓRBUS (ancient Latin name of *S. domestica*). Including *Aria*, *Aronia*, *Cormus*, *Micromelis* and *Torminaria*. *Rosàceæ*. Ornamental deciduous trees or shrubs, with alternate simple or odd-pinnate leaves, white or rarely pinkish flowers in terminal corymbs and berry-like, usually red fruit. Most of them are hardy north except some Asiatic species and *Sorbus domestica*, which seem tender north of Mass. They are chiefly inhabitants of mountainous regions, and the northern species, as *S. Americana* and *sambucifolia*, do not thrive well in warmer and drier climates, while *S. Aria*, *torminalis* and allied kinds endure drought and heat well. They all have handsome foliage, which usually turns orange-red in fall. The fruits are showy and often remain on the branches the whole winter if not eaten by birds. They are not particular as to the soil and are well suited for planting on rocky hillsides. Those of the Aucuparia group are more adapted for cool and moist mountain regions; those of the Aria and Torminaria group, which grow specially well on limestone soil, are suited to warmer and drier climates. *S. hybrida* is sometimes used as a small-sized avenue tree on account of its regular pyramidal habit. *S. arbutifolia* and *S. melanocarpa* are handsome shrubs for borders of shrubberies; they prefer moist soil, but *S. melanocarpa* also grows in drier rocky situations. Prop. by seeds sown in fall or stratified; also by layers, and *S. arbutifolia* and *S. melanocarpa* from greenwood cuttings. Varieties and rarer kinds are usually budded or grafted on allied species, but most kinds will grow on *S. Aucuparia* or *Americana* and on Hawthorn. The trees are very subject to borers.

About 30 species distributed throughout the northern hemisphere, in N. America south to Fla. and New Mex., in Asia south to the Himalayas. Lvs. simple or odd-pinnate, stipulate: fls. in compound corymbs; sepals and petals 5; stamens 15–20, with red or yellow anthers; styles 2–5, free or connate at the base: fr. a 2–5-loculed pome, usually rather small, with 1 or 2 seeds in each cell. Closely allied and often referred to Pyrus, from which it is chiefly distinguished by its compound inflorescence and by the fls. being more or less perigynous except in the Micromeles group, which has a decidedly inferior ovary like Pyrus; the fruits, too, are usually smaller and berry-like.

INDEX.

Americana, 3.
arbutifolia, 13.
Aria, 12.
Aucuparia, 1.
aurea, 12.
aurea-striata, 11.
chrysophylla, 12.
Clusii, 8.
Cretica, 12.
Decaisneana, 12.
decurrens, 6.
domestica, 5.
dulcis, 1.
edulis, 12.
erythrocarpa, 13.
fastigiata, 1.
Fennica, 6.
Fifeana, 1.
flabellata, 11.
flabellifolia, 11.
floribunda, 14.
fructu luteo, 1.
Græca, 12.
grandifolia, 14.
Grayi, 4.
heterophylla, 7.
hybrida, 6.
intermedia, 10.
laciniata, 1.
lanuginosa, 6.
latifolia, 9.
lutescens, 12.
maliformis, 5.
melanocarpa, 14.
micrantha, 3.
microcarpa, 3.
Moravica, 1.
Nepalensis, 12 & suppl. list.
nigra, 14.
nivea, 12.
occidentalis, 4.
pendula, 1.
pinnatifida, 6.
pumila, 4.
pyrifolia, 13.
pyriformis, 5.
quercifolia, 6.
quercifolia floribunda nana, 7.
quercoides, 6.
Rossica, 1.
rotundifolia, 9.
sambucifolia, 4, 6.
Sargenti, 7.
Scandica, 10.
Sorbus, 5.
spuria, 7.
subpubescens, 14.
Suecica, 10.
Thianschanica, 2.
Thuringiaca, 6.
Tianschanica, 2.
torminalis, 8.

A. *Foliage pinnate.*

B. *Lvs. regularly pinnate, with the lfts. of almost equal size.*

C. *Fruits small, ¼-⅜ in. across or slightly larger, berry-like. (Aucuparia group, species 1-4.)*

D. *Winter-buds covered with white villous tomentum.*

E. *Young branchlets and lvs. pubescent* .... 1. **Aucuparia**

EE. *Young branchlets and lvs. glabrous* .... 2. **Tianshanica**

DD. *Winter-buds glutinous, glabrous or sparingly appressed, rusty-pubescent.*

E. *Lfts. long-acuminate: fls. ⅕-¼ in.: fr. ⅙-¼ in. across* .... 3. **Americana**

EE. *Lfts. acute or obtusish: fls. ¼-⅓ in. across: fr. about ⅓ in. across*..... 4. **sambucifolia**

CC. *Fruits ½ in. or more across, apple- or pear-shaped, with grit-cells: styles 5. (Cormus group, species 5-7.)* .... 5. **domestica**

BB. *Lvs. only pinnate toward the base, lobed or only serrate in the upper part, varying much on the same plant and occasionally only lobed. Hybrids.*

C. *Habit tree-like* .... 6. **hybrida**

CC. *Habit shrub-like* .... 7. **spuria**

AA. *Foliage simple.*

B. *Styles 2: trees or rarely shrubs.*

C. *Under side of lvs. glabrous at length, green: lvs. lobed: fr. brown, with grit-cells. (Torminaria group, species No. 8.)*..................... 8. **torminalis**

CC. *Under side of lvs. grayish or whitish tomentose. (Aria group, species 9-12.)*

D. *Lvs. lobed. (See also No. 6.)*

E. *Pairs of veins 5-9.*

F. *Base of the usually broadly ovate lvs. mostly rounded*..... 9. **latifolia**

FF. *Base of the ovate to oblong-ovate lvs. broadly cuneate*.....10. **intermedia**

EE. *Pairs of veins 3-5; under side of veins densely snowy white, tomentose.*11. **flabellifolia**

DD. *Lvs. not or but obscurely lobed; pairs of veins 6-12.*12. **Aria**

BB. *Styles 5: shrubs with crenately serrate lvs. (Aronia [Adenorhachis] group, species 13-14).*

C. *Fruits red: lvs. tomentose beneath* ....13. **arbutifolia**

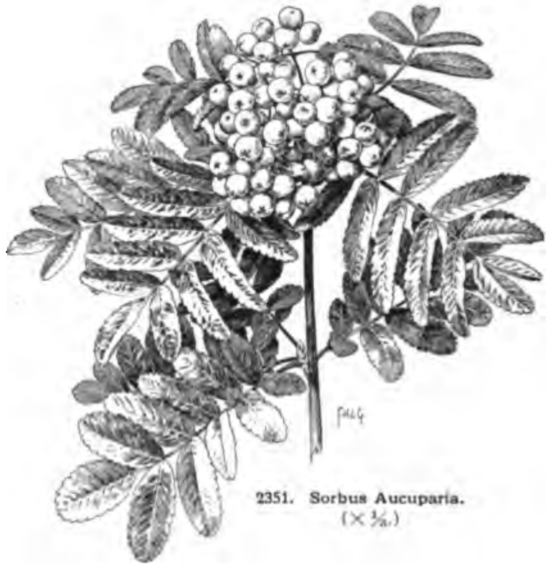
CC. *Fruits black: lvs. glabrous or nearly so* ....14. **melanocarpa**

(*Aucuparia group, species* 1-4.)

1. **Aucupària,** Linn. (*Pýrus Aucupària*, Gærtn.). EUROPEAN MOUNTAIN ASH. ROWAN TREE. Fig. 2351. Round-headed tree, 20 to 40, occasionally 60 ft. high: young branchlets pubescent, grayish brown when older: petioles more or less tomentose: lfts. 9-15, oblong to oblong-lanceolate, serrate, entire toward the base, dull green above, pubescent beneath or rarely glabrous, ¾-2 in. long: fls. white, ⅓ in. across, in flat, 4-6-in. broad, tomentose or sometimes almost glabrous corymbs; stamens about as long as petals: fr. globose, about ⅓ in. across, bright red. May, June. Europe to W. Asia and Siberia.—Var. **dúlcis,** Kraetzl. (var. *Moràvica*, Zengerl.). Almost glabrous: petioles purplish; lfts. oblong-lanceolate, 2-3 in. long, glaucescent beneath. The fruits are of an agreeable acid flavor and recommended for preserves. The tree thrives well in cold northern climates where hardly any other fruit tree will grow. Var. **dúlcis laciniàta,** Beissn., is a handsome and graceful form with the lfts. pinnately lobed and the leaf-stalks and young branchlets bright red. Var. **fastigiàta,** Loud., forms a narrow pyramidal tree, with upright branches. Var. **péndula,** Hort., has long and slender pendulous branches. Var. **Róssica,** Hort., seems little or not different from var. *dulcis*. Var. **frúctu lùteo** and var. **Fifeàna,** Hort., have yellow fruits. There are vars. with variegated foliage of the typical and of the weeping form. The fruits of *S. Aucuparia*, *S. domestica*, *torminalis* and var. *dulcis* are edible, and the strong and close-grained wood of *S. domestica* and *S. torminalis*, and in a lesser degree that of *S. Aucuparia*, is valued for handles of tools and similar small articles. See *Pyrus*.

2. **Tianschánica,** Rupr. (*Pýrus Thianschánica*, Regel). Small tree or shrub, similar to the preceding: young branchlets glabrous, red-brown and glossy when older: petioles and lvs. glabrous: lfts. 11-15, lanceolate, acuminate, serrate, entire toward the base, dark green and glossy above, light green beneath, about 2 in. long: corymbs glabrous; stamens half as long as petals: styles 2-5: fr. globose, bright red. May, June. C. Asia. Gt. 40, p. 8. B.M. 7755.—Very handsome on account of the contrast of its dark green foliage and red-brown branches.

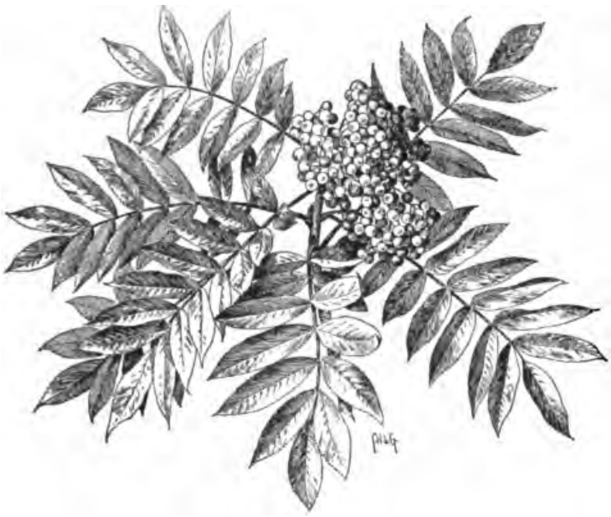
3. **Americàna,** Marsh. (*Pýrus Americàna*, DC. *S. micrántha*, Dum-Cours.). AMERICAN MOUNTAIN ASH. DOGBERRY. Fig. 2352. Small tree, attaining 30 ft., with spreading branches, or sometimes shrubby: lfts. 11-17, lanceolate, long-acuminate, sharply serrate, glabrous or slightly pubescent when young, light green above, paler beneath, 1½-4 in. long: fls. one-fifth to ¼ in. across, in dense, 3-6-in. broad, usually glabrous corymbs: fr. globose, bright red, ⅙-¼ in. across, with the calyx-lobes very small and connivent. May, June. Newfoundland to Manitoba, south to Mich. and N. C. S.S. 4:171, 172.—Var. **microcárpa,** Torr. & Gray (*S. microcárpa*, Pursh), has narrower foliage and very small fruits about ⅙ in. across.



2351. Sorbus Aucuparia. (× ⅓.)

4. **sambucifòlia,** Rœm. (*Pýrus sambucifòlia*, Cham. & Schlecht.). WESTERN MOUNTAIN ASH. Small tree or shrub, closely allied to the preceding: lfts. 7-15, oval to ovate-lanceolate, obtuse to short-acuminate, sharply serrate, glabrous and dark green above, glaucescent and usually pubescent beneath when young, 1½-3 in. long: fls. ¼-⅓ in. across, in 2-4-in. broad and rather loose corymbs, sometimes few-fld.: fr. globose, ovoid when young, red, about ⅓ in. across, with more or less upright calyx-lobes. June, July. Labrador to Alaska south to Pa., Mich. and Calif., N. E. Asia and Japan. S.S.

4:173, 174.—A very variable species; the eastern form resembles more the preceding species, and intermediate forms are not uncommon in the northeastern states. The most distinct form is var. **Gràyi**, Wenz. (var. *pùmila*, Sarg. *Pỳrus occidentàlis*, Wats.). Shrubby: lfts. 7–11, oval to oval-oblong, obtuse, with only a few teeth at the apex, bluish green: corymbs 1–2 in. across. Wash. to Calif. G.F. 10:85. *S. sambucifolia* is often confounded with the preceding species; both are very handsome in autumn with their large clusters of bright red fruits. Sometimes a form of *S. hybrida* is found in American nurseries under the name of *S. sambucifolia*.


2352. Sorbus Americana (× ⅓)

(Cormus group, species 5–7.)

5. **doméstica**, Linn. (*Pỳrus Sórbus*, Gærtn. *P. doméstica*, Smith. *Córmus doméstica*, Spach). SERVICE TREE. Fig. 2353. Round-headed tree, 30–60 ft. high: winter-buds glutinous: petioles tomentose; lfts. 11–17, obovate-oblong to oblong, sharply and rather coarsely serrate, with acuminate teeth, usually entire near the base, green and glabrous above, floccose-tomentose beneath, at least when young, 1–2½ in. long: fls. white, ½ in. across, in broadly pyramidal rather loose, tomentose corymbs: fr. ½–1¼ in. across, usually yellowish, with red or orange cheek, apple-shaped in var. **malifórmis**, Lodd., pear-shaped in var. **pyrifórmis**, Lodd. May. S. Eu., N. Afr. and W. Asia. G.C. II. 1:283; 6:649. M.D.G. 1897:376–378.—This species is often confounded with the European ash, from which it is almost indistinguishable without fruits or flowers, except by the glutinous winter-buds.

6. **hỳbrida**, Linn. (*Pỳrus pinnatìfida*, Ehrh. *P. Fénnica*, Babingt. *S. intermèdia* × *Aucupària*). Tree, attaining 40 ft., of regular, pyramidal habit with upright branches: young branchlets and petioles whitish tomentose; lvs. ovate to oblong-ovate, with 1–4 pairs of decurrent lfts. at the base, or but pinnately lobed, upper part lobed with the lobes becoming gradually shorter and more indistinct toward the apex, dark green above, whitish or grayish tomentose beneath, 2½–5 in. long; petioles about 1 in. long: fls. ⅓–½ in. across, in tomentose corymbs about 3 in. broad: fr. globose-ovoid, ½ in. high. May, June.—Natural hybrid, occasionally found with the parents in Europe. Two different hybrids are usually included under *S. hybrida;* the typical one is *S. Aucuparia* × *intermedia*, which has the lvs. oblong-ovate to oblong, 3–5 in. long, with 10–12 pairs of veins, the lfts. and lobes narrower and pointed and the veins often slightly recurved. It is mostly cult. under the name of *S. quercifòlia* or *quercoìdes*, Hort. The second hybrid is var. *Thuringìaca*, Rehd. (*Pỳrus Thuringìaca*, Ilse), and is a hybrid of *S. Aucuparia* × *Aria;* it has ovate- to ovate-oblong lvs., somewhat more deeply lobed, 2½–4 in. long, with 8–10 pairs of veins, lfts. and lobes broader and obtusish, with the veins usually curving upwards. This is known in gardens as *S. quercifòlia hỳbrida nàna*. Var. **decúrrens**, Koehne (*S. lanuginòsa*, Hort., not Kit.), is a transition to *S. Aucuparia;* only the 3 or 5 upper lfts. are connate into a terminal lft., which, like the upper separate lfts., is decurrent at the base, under side less densely tomentose. In some nurseries under the name of *S. sambucifolia*.

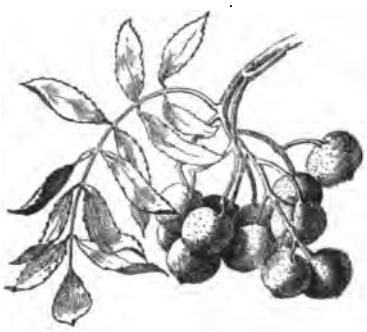
7. **spùria**, Pers. (*Pỳrus heterophýlla*, Dur. *S. Aucupària* × *arbutifòlia*). Shrub or small tree, attaining 15 ft., with slender, sometimes pendulous branches: lvs. ovate to oblong-ovate, obtuse, with 2–6 lobes or lfts. near the base, simply crenate-serrate toward the apex, 1½–3½ in. long, pubescent or glabrous beneath: fls. white or pinkish white, in pubescent or glabrous corymbs 1–1½ in. broad: fr. subglobose or pear-shaped, dark purple or almost black. May, June. Of garden origin. B.R. 14:1196.—Sometimes cultivated under the name *S. quercifolia floribunda nana*. Hybrids of different origin are usually united under *S. spuria;* the more pubescent forms with dark purple fr. are probably the offspring of *S. Aucuparia* and *S. arbutifolia*, while the more glabrous forms with usually blackish fruit have *S. Aucuparia* and *S. melanocarpa* as their parents. A similar form with quite glabrous and more pointed lvs., originated at the Arnold Arboretum and probably a hybrid of *S. Americana* and *S. melanocarpa*, was named *S. Sárgenti*, Dipp.

(Torminaria group, species No. 8.)

8. **torminàlis**, Crantz (*Pỳrus torminàlis*, Ehrh. *Torminària torminàlis*, Dipp. *T. Clùsii*, Rœm.). WILD SERVICE TREE. Round-headed tree, with spreading branches, 40–80 ft. high: lvs. broadly ovate, slightly cordate to broadly cuneate at the base, with several triangular-ovate, serrate lobes on each side, the lower sinuses reaching about half way to the middle, floccose-tomentose when young, 2–4 in. long; petioles 1–1¾ in. long: fls. white, ½ in. across, in broad, rather loose tomentose corymbs: fr. oval, ½–¾ in. high, brown, dotted. May, June. Southern and middle Europe.—The foliage turns bright red in fall.

(Aria group, species 9–12.)

9. **latifòlia**, Pers. (*Pỳrus rotundifòlia*, Bechst. *P. intermèdia*, var. *latifòlia*, Ser. *P. Aria*, var. *latifòlia*, Hort. *Torminària latifòlia*, Dipp. *S. Aria* × *torminàlis*). Tree, attaining 50 ft., similar to the preceding: lvs. broadly ovate to ovate, usually rounded at the base, pinnately lobed with short, broadly triangular, sharply serrate lobes and with 6–9 pairs of veins, grayish or whitish tomentose beneath, 2½–4 in. long: petioles ½–1 in. long: fls. about ½ in. across, in broad, tomentose corymbs: fr. globose or globose-ovoid, about ½ in. high, orange to brownish red. May, June. Occasionally occurring in middle Europe.


2353. Sorbus domestica (× ½).

10. **intermèdia**, Pers. (*Pỳrus intermèdia*, Ehrh. *Sórbus Scándica*, Fries. *Aria Suècica*, Koehne. *Hàhnia Suècica*, Dipp.). Tree, 20–40 ft. high, with oval head: lvs. ovate to oblong-ovate, broadly cuneate at the base,

pinnately lobed with broad and short, irregularly serrate lobes and 5–8 pairs of veins, whitish tomentose beneath, 2½–4 in. long; petioles ½–¾ in. long: fls. about ½ in. across, in broad, tomentose corymbs: fr. orange-red, globose or subglobose, about ½ in. high. May. Northern and middle Europe.—This is sometimes confounded with *S. hybrida* and considered to be a hybrid of similar origin, but it is certainly a good species. It never bears distinct leaflets at the base and the sinuses do not reach farther than one-third toward the middle.

11. **flabellifòlia,** S. Schau. (*Pỳrus Aria*, var. *flabellifòlia*, Arb. Kew. *Aria flabellifòlia*, Decne. *S. flabellàta*, Hort.). Small tree, attaining 20 ft.: lvs. orbicular to broadly oval, obtuse, usually broadly cuneate at the base, incisely lobed above the middle, with the short lobes truncate or rounded and coarsely toothed, snowy white beneath, 1½–2½ in. long: fls. scarcely ½ in. across, in dense, white-tomentose corymbs: fr. depressed-globose, orange-red. Southeastern Eu., W. Asia.—Cult. in some nurseries as *Pyrus aurea striata*.

12. **Ària,** Crantz (*Pỳrus Ària*, Ehrh. *Ària nìvea*, Hort. *Háhnia Aria*, Med.). White Beam-tree. Fig. 2354. Tree, with broadly pyramidal or oval head, 25–50 ft. high: lvs. roundish obovate to oblong-oval, usually cuneate at the base, acute or obtuse at the apex, sharply and doubly serrate, of firm texture, bright or dark green and glabrous above, white-tomentose beneath, 2–5 in. long; petioles ½–¾ in. long: fls. ½–¾ in. across, in tomentose, 2–3-in. broad corymbs: fr. subglobose, orange-red, about ½ in. high. May. Middle and southern Europe to Himalayas and Siber.—Desirable tree for dry and exposed situations, and very ornamental in foliage on account of the contrasting colors of the upper and under sides of the leaves. Several vars. are known. Var. **Crética,** Lindl. (*Aria Græca*, Decne.). Lvs. orbicular-obovate, coarsely doubly serrate, 1½–3 in. long, with 6–10 pairs of veins. Southern Eu. Var. **Decaisneàna,** Rehd. (*Aria Decaisneàna*, Lav. *Pỳrus Decaisneàna*, Nichols.). Lvs. elliptic to oblong-ovate, acute, irregularly doubly serrate, 3–6 in. long: stamens longer than petals: fr. oval. Probably from the Himalayas and sometimes cult. as *S. Nepalénsis*. Var. **édulis,** Wenzig (*Pỳrus édulis*, Willd.). Lvs. elliptic-oblong to oblong, rounded or acute at the apex, 2–5 in. long: fr. oval, ½–¾ in. high. There are some garden forms, as vars. **aùrea, chrysophỳlla** and **lutéscens,** with more or less yellow foliage.

(*Aronia group, species Nos. 13 and 14.*)

13. **arbutifòlia,** C. Koch (*Pýrus arbutifòlia*, Linn. f. *Arònia arbutifòlia*, Elliot. *A. pyrifòlia*, Pers. *Méspilus arbutifòlia*, var. *erythrocárpa*, Michx.). Red Chokeberry. Upright shrub, 6–12 ft. high: lvs. short-petioled, oval to oblong or obovate, acute or abruptly acuminate, crenately serrate, glabrous above except some glands on the midrib, whitish or grayish green and tomentose or pubescent beneath, 1½–3 in. long: corymbs tomentose, few to many-fld., 1–1½ in. broad: fls. white or tinged red, ⅓–½ in. across: fr. subglobose or pear-shaped, bright or dull red, about ¼ across. April, May. Nova Scotia to Minn., south to Fla. and La. B.M. 3668. G.F. 3:417.

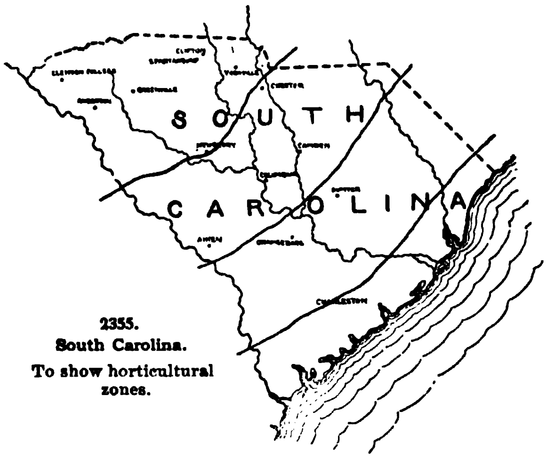
14. **melanocárpa,** C. Koch (*Pỳrus nìgra*, Sarg. *Arònia nìgra*, Koehne. *Pỳrus arbutifòlia*, var. *nìgra*, Willd.). Black Chokeberry. Closely allied to the preceding, usually lower: lvs. oval to obovate, abruptly acuminate or obtuse, pale green and glabrous or nearly so beneath: calyx and pedicels glabrous or nearly so: fr. globose, about ⅓ in. across, shining black. Nova Scotia to Ontario, south to Fla. and Mich. April–June. B.B. 2:237. Var. **grandifòlia,** Dipp. (*Pỳrus grandifòlia*, Lindl.), has larger, obovate or broadly obovate lvs. and larger fls. B.R. 14:1154. Var. **subpubéscens,** Lindl., has the lvs. pubescent beneath when young. An intermediate form between the two preceding species is figured in B.R. 12:1006 as *Pỳrus floribúnda*, Lindl.; similar forms are found wild occasionally in the northeastern states. Both species are handsome shrubs; *S. melanocarpa* is prettier in foliage and in bloom, while *S. arbutifolia* has showier and usually more numerous fruits. The fruits of both species remain on the branches during the winter.

S. alnifòlia, Wenzig (Pyrus Miyabei, Sarg. Micromeles alnifolia, Koehne). Tree, 60 ft. high: lvs. obovate and abruptly acuminate or ovate, serrate, glabrous at length, but on vigorous shoots, often remaining tomentose beneath, 2–4 in. long: fls. in 6–12-fld., almost glabrous corymbs: fr. subglobose, ¼ in. across. Japan. Gt. 41, p. 283, 284. G.F. 7:84.—*S. Chamæméspilus*, Crantz (Pyrus Chamæmespilus, Poll. P. alpina, Dur. Aria Chamæmespilus, Hos.). Upright shrub, 6 ft. high, allied to S. Aria. Lvs. elliptic to oblong serrate, almost glabrous, 1½–2½ in. long: fls. pinkish, with upright petals, in dense corymbs about 1½ in. broad: fr. oval, orange to brownish red. Middle and southern Europe.—*S. densiflòra*, Heynh. (Pyrus densiflora, Spach. P. alpina, Willd., not Dur. Aronia alpina, Dipp.). Hybrid of garden origin between S. Aria and S. melanocarpa: shrub, 5 ft. high: lvs. oval to elliptic-oblong, whitish tomentose beneath, 1½–3 in. long: fls. white or pinkish, in dense corymbs 1–1½ in. broad: fr. pear-shaped, dark bluish purple.—*S. discolor*, Maxim. Closely allied to S. Aucuparia, but quite glabrous: lfts. oblong-lanceolate, larger, glaucous beneath. N. China.—*S. grácilis*, Wenzig (Pyrus gracilis, Sieb. & Zucc.). Shrub, with pinnate lvs., those at the base of the loose, few-fld. corymbs with large, incised-dentate stipules. Japan.—*S. Hòstii*, C. Koch (Pyrus Hostii, Hemsl. P. Sudetica, Tausch. Aria Hostii, Jacq. f.). Supposed to be a hybrid between S. Aria and Chamæmespilus: shrub or small tree, 12 ft. high: lvs. oval to elliptic-obovate, sharply serrate: fls. pinkish, in dense corymbs about 2½ in. broad: fr. globose, ovoid, red. Mts. of M. Europe. Gn. 20:305. R.H. 1877:210.—*S. lanàta*, Wenzig (Pyrus lanata, Don. S. majestica, Hort.). Tree, allied to S. Aria: lvs. oval, sharply and doubly serrate and slightly lobed, 4–7 in. long; styles 2–3, woolly: fr. globose, ½–1½ in. across. Himalayas.—*S. Nepalénsis*, Hort. = S. vestita; also vars. of S. Aria are often cult. under this name.—*S. terminàlis*, Hort. = Photinia villosa.—*S. trilobàta*, Heynh. (Pyrus trilobata, DC.). Small tree: lvs. rather small, almost orbicular, 3-lobed, with spreading, denticulate lobes, glabrous: fls. white, with 5 styles: fr. subglobose, ¾ in. across. W. Asia.—*S. vestìta*, S. Schan. (Pyrus vestita, Wall. P. crenata, Lindl. S. Nepalensis, Hort.). Tree, allied to S. Aria: lvs. elliptic to elliptic-oblong, doubly serrate, densely tomentose beneath, 3–7 in. long; styles 5, woolly at the base only. Himalayas. G.C. II. 1:17.

Alfred Rehder.

2354. Sorbus Aria (× ¼).

SÓRGHUM. The genus Sorghum is referred to Andropogon by Hackel and others, and its botanical relations are discussed under that name. It forms a section of that genus, only one species of which is of economic importance. The various cultivated varieties known as Sorghum, Broom Corn, Kaffir Corn, Jerusalem Corn, Millo Maize, Durra, etc., are considered as having been derived from the wild species, *S. Halepense* (*Andropogon Halepensis*). Others maintain these cultivated forms as varieties of a distinct species, *Sorghum vulgare* (*Andropogon Sorghum*). The cultivated forms are annuals, with tall jointed stems, bearing large terminal panicles. They fall naturally into three groups, depending upon their uses: (1) Broom Corn, in which the branches of the panicle are elongated and are thus adapted to the manufacture of brooms; (2) the Sugar or Saccharine Sorghums, with loose panicles, the branches drooping, and red-brown spikelets, cultivated for the sweet juice and for forage. Amber and Orange are leading forms of Sorghum. See *Saccharum*. (3) The remaining varieties are grouped together as Non-Saccharine Sorghums. They are grown for forage and for the seed. Gn. 4, p. 83 (*S. bicolor*). The common forms grown in this country and offered in the trade are: Kaffir Corn, with stems 4–5 feet high, stocky growth, and dense, upright panicles; Millo Maize, or African Millet, similar but about twice as tall; Durra (variously spelled Doura, Dhoura, etc.), including Egyptian Rice Corn, Guinea Corn, etc., with compact panicles on a recurved stalk. A. S. Hitchcock.



2355. South Carolina. To show horticultural zones.

SORREL. Various species of Rumex (which see) produce large, thick, acid leaves which are prized for salads or for "greens." Leaves of some of the native or naturalized species are gathered as pot-herbs in many parts of the country. In the Old World, however, several species are regularly cultivated in kitchen-gardens; in this country these cultivated species are relatively little known. They are perennials of the very easiest culture. Usually they persist for a number of years after well established, giving an abundance of soft edible leaves early in the spring when herbage is scarce. They are usually grown from seeds, and plants fit for cutting may be had when the plants are one or two years old. Plants should be placed at one side of the garden where they will not interfere with the regular tillage. No special treatment is demanded. When they begin to show signs of failing, new plants should be started or the old ones may be taken up and divided. The rows should stand about 18 in. apart. Do not let the plants exhaust themselves by seed-bearing. The Spinach Dock (*Rumex Patientia*) is one of the best and earliest. The Belleville (*Rumex Acetosa*) is also an excellent plant for the home garden and has the advantage of following the other as a succession. Various other species may be had of European seed dealers. See *Dock*. L. H. B.

SORREL-TREE. *Oxydendrum.*

SORREL, WOOD. *Oxalis Acetosella.*

SOUR GUM. See *Nyssa sylvatica.*

SOUR SOP. *Anona muricata.*

SOUR WOOD. *Oxydendrum.*

SOUTH CAROLINA, HORTICULTURE IN. Fig. 2355. Owing to the combined influence of varieties of soil, latitude and elevation, the climatic conditions of South Carolina and the range of horticultural productions are remarkably varied. With reference to its adaptation to amateur and commercial horticulture, this state may be divided into four belts by lines drawn roughly from southwest to northeast.

The coast region, embracing a tier of counties bordering the Atlantic ocean and a number of fertile islands, is especially adapted to commercial horticulture. A considerable area is devoted to growing early vegetables to supply the large cities of the northeastern states. The principal species grown for shipment are green peas, Irish potatoes, cabbage, asparagus and beans. The Hoffman and Neunan varieties of strawberries, which are especially adapted to this region, are also grown for shipment. The fig grows to perfection here, but has not as yet been produced on a commercial scale. The capabilities of this region have been only partially developed on account of the habit and profit of sea island cotton and rice culture. The fungous disease known as asparagus rust has seriously menaced the asparagus plantations.

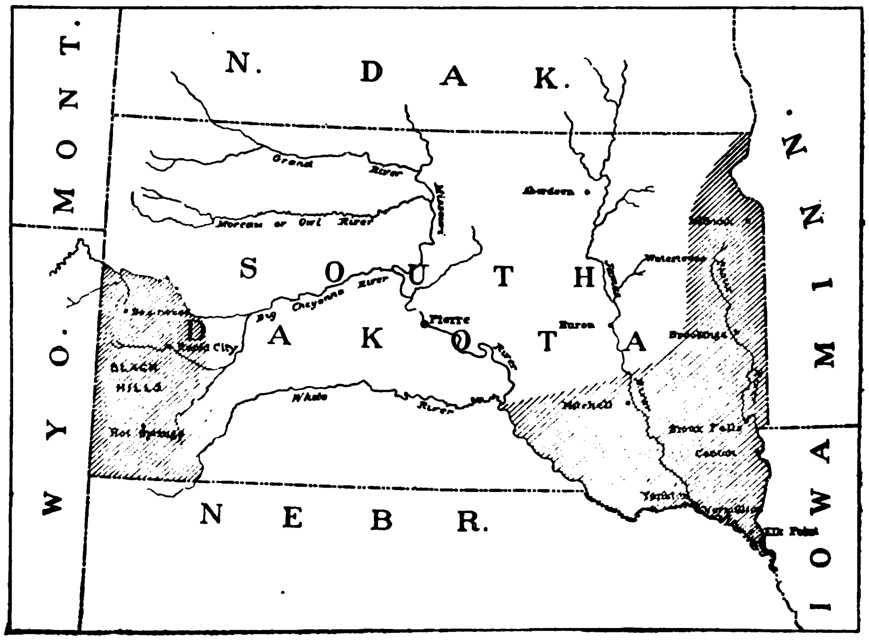
The Pine Belt, or second zone, embraces two formations, popularly known as the Upper and Lower Pine Belts. The latter covers an area of about 9,000 square miles; the former 5,000. The Upper Belt embraces the best farming and horticultural lands of the state. The surface is generally level, with an elevation of 250 feet. Both of these belts contain large areas especially adapted to vegetable- and fruit-growing, especially melons. These industries are receiving more and more attention every year as the land-owners become more familiar with the intensive methods necessary for successful truck-farming and the commercial requirements for successfully handling large crops of perishable products. Asparagus, early potatoes, watermelons and cantaloupes are at present the principal crops grown for the northern markets. The sweet potato grows to perfection in this region, 400 to 600 bushels per acre being easily produced. Recent experiments by the Agricultural Department of the Experiment Station in preparing the sweet potato for compact shipment seem to open the way for carrying this vegetable to all parts of the world. This section is especially adapted to the fig, the oriental types of pears and plums and to the early varieties of peaches and apples. While affording every facility for commercial horticulture, there is, perhaps, no part of the globe where an abundant supply of fruits and vegetables may be more easily and continuously provided for domestic use. Fresh vegetables in season may be gathered from the garden every day in the year.

The Hill Belt, fifty miles in width, stretching across the state from Georgia to North Carolina, is more varied in soil and elevation, affording a wide range of soil products. In some sections of the Hill Belt rapid strides have been made in peach- and melon-growing for market. From a limited area around Ridge Springs 150 car-loads of peaches were shipped in 1900; from this section also large shipments of melons and asparagus are made. The rapid development of manufactures has created a home market for large quantities of fruit and vegetables. Grapes of superior quality are grown throughout this belt. Standard Labrusca grapes, such as Delaware, Concord and Niagara, are remarkably exempt from diseases which are more destructive in other sections. The Rotundifolia family, or southern fox grape type, most commonly known from the amber-colored variety, Scuppernong, succeeds well from the mountains to the coast. Other varieties of the same family are more productive than the Scuppernong, such as the Mish Memory, Tender Pulp, Thomas, James and Flowers. The berries of some of these varieties adhere to the stems and grow in bunches of from 16 to 24 grapes, hence may be as readily shipped as the Delaware. When trained upon vertical trellises and pruned in early fall, the yield far exceeds that of any other type.

The Piedmont and Alpine regions, ranging in elevation from 400 to over 3,000 feet, varies even more than the hill country in variety of products to which it is adapted. The cherry, peach, pear, grape, small fruits and apple afford a tempting variety. The succession of fruits spans the seasons, the winter apples lasting until strawberries are ripe. While little has been done in this great region towards growing fruit and vegetables for shipment, the cotton mills, so numerous in this section, have converted the farms in their vicinity into market-gardens. The typical mountain wagons, hooded with white canvas, laden with luscious apples, mammoth cabbages, mealy potatoes and fragrant onions, products of the rude methods of the inhabitants of the highland region, are only suggestions of the possibilities of the fertile valleys and mountain coves under the manipulation of skilful hands guided by the trained head.

J. S. Newman.

SOUTH DAKOTA, HORTICULTURE IN. Fig. 2356. South Dakota, the twenty-seventh state admitted into the Union, lies a little north of the center of the continent, between lat. 45° 57′ N. and 42° 28′ S. and long. 96° 26′ and 104° 3′ W. of Greenwich. Its shape is approximately a rectangle. Its extreme length from east to west is 386 miles; extreme breadth north to south 240 miles; area 76,815 square miles; population (in 1900) 401,570. The Missouri river divides the state into two nearly equal portions. With the exception of a small area in the northeast corner, the southeast part is lowest and all the streams flow in that direction. The state may be divided into three sections: (1) the Black Hills; (2) the Table-lands; (3) the Eastern Section.



2356. Map of South Dakota.
Showing areas favorable to fruit-growing, the broken-shaded portions being the most favorable.

The Black Hills in the southwestern part are outliers of the Rocky Mountains, and the extensive and very rich deposits of gold, silver, and other minerals are important sources of wealth. The Indians early knew of these gold deposits, but they were not known to white men until 1874. The Black Hills, so named by the Indians because of the heavy forests of pine and spruce covering the mountains, include an area of about 5,000 square miles. Considerable fruit is now being raised in this section under irrigation, as the local market is a profitable one, and it has been found possible to raise many varieties not hardy upon the open prairies of the state.

The Table-lands comprise the entire section of the state west of the Missouri river, with the exception of the Black Hills. Five branches of the Missouri flow from the western part of the state across these lands from west to east. These are White, Bad, Cheyenne, Moreau or Owl, and Grand rivers. The rainfall in this part is too light to make general farming feasible, but the native grasses are very nutritious and stock-raising is profitable. Cattle, horses and sheep are raised in immense numbers and feed the year round upon these ranges, the dry climate curing the grass into the best of hay as it stands.

The eastern section contains three river valleys that cross it from north to south, viz., the eastern half of the Missouri, the James river valley and the Big Sioux river on the eastern border. In the southern part the valley of the Vermillion traverses the region between the Sioux and the James. These river valleys are all very fertile and blend together as they reach the Missouri at the south. Diversified agriculture flourishes in these rich valleys, especially in the southern and entire eastern part of this section. In the higher ground in the northern and western part, stock-raising and dairying are the main industries owing to the lesser rainfall. Since the defining of the artesian-well basin, general agriculture has been encroaching upon the grazing areas. This basin reaches from the Missouri river eastward to some distance beyond the James. The pressure and flow of these artesian wells varies from a few pounds to 200 pounds per square inch. A flow of more than 3,000 gallons per minute has been obtained from an 8-inch well. These wells are from 100 to 1,500 feet in depth, and afford a valuable means of irrigation and cheap water-power. The water is supposed to come from the Rocky Mountain region. The amount of this supply which can be used has been roughly estimated at 326,805,600,000 cubic feet annually, an amount of water sufficient to fill a river-bed a mile wide, 20 feet deep and nearly 600 feet long. When this water is more generally utilized, it is confidently believed that the horticultural area shown on the map will be extended to include the entire state east of the Missouri river.

Horticulture in South Dakota is to a considerable extent still in the experimental stage. Most of the planting of orchard fruits has been done since the last "crucial test" winter of 1884–85, hence it will be difficult to give a safe list until after the next test winter. A glance at the map will show that the state extends well below the north line of Iowa, and as a matter of fact we find that the South Dakota fruit list partakes of both Iowa and Minnesota in its characteristics. The southern tier of counties in the southeast corner of the state can raise varieties of the apple which are not at all hardy northward in the state. It is interesting to trace the orcharding belt along the great river from far down in Missouri northward between Iowa and Nebraska and northward into South Dakota. In the Sioux and James river valleys considerable fruit is grown as far north as the Minnesota line. North of this the orchards are few and far between, the country being new and grain-raising, stock-raising and dairying affording more profitable sources of income.

In making up a list of apples for planting throughout the state, it will be a safe rule not to plant any variety less hardy than Oldenburg and Wealthy, especially if the planter desires a long-lived, fruitful orchard and cannot afford to experiment. The State Horticultural Society recommends the following for trial or general cultivation in all of the twelve fruit districts; viz., Oldenburg, Hibernal, Charlamoff, Wealthy.

The largest orchard in the state is in Turner county, consisting of 7,000 trees on about 132 acres. This orchard was planted in the early seventies and still yields profitable crops. About 4,000 of the trees are Wealthy and most of the remainder Oldenburg.

Considerable trouble is experienced from root-killing of the common apple seedling stocks. In the northern part of the state, apple root-grafts root-kill every winter unless deeply mulched. The winter of 1898–99 will long be remembered as the "root-killing" winter by the fruit men of several northwestern states. Efforts are now being made to remedy this trouble by testing the Russian method of preventing root-killing; viz., the use of the pure Siberian crab (*Pyrus baccata*), as a stock. If the experiments are successful apple culture will be practicable in both Dakotas and in a part of the Canadian northwest. Piece root-grafting will not be a fair test, as everything below ground should be Siberian. (See Bull. 65 of S. D. Exp. Sta., and Am. Pom. Soc. Report, 1899, p. 143.)

Of plums, only those of the Americana type, such as DeSoto, Wyant, Wolf, Forest Garden, Rollingstone and Hawkeye, are of any value for general cultivation. However, in the southern tier of counties already mentioned the Miner does well and is much grown. *Prunus Americana* is indigenous throughout the state. Many varieties from the native thickets are being grown by the prairie settlers, and these will probably supersede the varieties named above, which originated in Iowa, Minnesota and Wisconsin. Plums rightly managed are very profitable and the general interest in them is increasing. The main trouble hitherto has been the tender stocks upon which the hardy natives have been worked. Myrobolan, St. Julien, Marianna, Southern Chickasaw, peach, and other southern stocks all winter-kill, leaving the hardy top to die. Such trees are a delusion and a snare to the prairie planter, and this fact is becoming more generally known. Trees worked on Americana seedlings or trees on their own roots find favor, as no trouble is then experienced from root-killing. The western sand cherry (*Prunus Besseyi*), a native of the state, is being tested as a stock at the Experiment Station at Brookings. So far the indications are that it will be worthy of use as a dwarf stock for amateur use, the trees being dwarfed and bearing fruit at an early age. It is of some promise as a dwarf stock for peaches, such trees being of suitable size for convenient covering in winter or for growing in boxes.

Of other orchard fruits, pears, quinces, apricots and peaches find no place on the South Dakota fruit list. Cherries are grown to a small extent in the southern counties, but the crop is uncertain in most parts.

Raspberries can be grown with winter protection. Blackberries are not as hardy as raspberries. Strawberries are considerably grown in the southern part of the state, and irrigation is found profitable, as it insures a crop in dry seasons. Grapes are grown to some extent in the southern part of the state, but northward suffer severely from winter-killing and are not on the fruit list recommended for that part of the state. Janesville, a *Labrusca* × *riparia* (vulpina) hybrid, has been found to be hardier than those of the Concord type. It is probable that new varieties of grapes adapted to the prairie northwest will be produced by plant-breeding, using the indigenous *Vitis riparia* as a foundation. Toward this end about 5,000 wild grape seedlings were grown by the Experiment Station at Brookings in 1900, and this work of plant-breeding is being conducted on a large scale.

Over 27,000 seedlings of various native fruits were raised at this station in 1899–1900. The wild fruits are being crossed with tame whenever possible, but the main reliance is placed upon pure selection, acting upon the theory that "excess of food causes variation." The following native species have been taken in hand in this plant-breeding work: sand cherry, choke cherry, pin cherry, black currant, golden currant, gooseberry, buffalo berry, grape, hazelnut, high bush cranberry, Juneberry, plum, red raspberry, black raspberry, strawberry. The work with cultivated fruits is mainly with the apple, an attempt being made to combine the hardiness of the Russian sorts with the long-keeping capacity of the best American winter varieties. Several Siberian fruits have also been taken in hand. These were picked up by the writer in 1897–98 when sent on a ten months' tour of exploration in eastern Europe and western and central Asia by U. S. Secretary of Agriculture Hon. James Wilson. The state Legislature in March, 1901, granted an appropriation of $10,000 for a "plant-breeding building," for improved facilities in the breeding of horticultural and agricultural plants.

Of conifers, the hemlock, white pine, balsam fir, arborvitæ and Norway spruce fail on the open prairie, while Jack pine, bull pine, Scotch pine, northern red cedar, western white spruce, and Colorado silver or blue spruce all do well in open exposure. Of deciduous trees, the native species, such as ash, elm, box elder, black wild cherry and hackberry, all do well. Cottonwood and willows do well on moist land. Considerable loss was experienced in the earlier planting from a failure to recognize the fact that species covering a wide geographical range vary greatly in hardiness and that the local indigenous form should be planted when possible.

Floriculture is still in its infancy, there being very few greenhouses in the state. The rich soil makes it easy to raise large crops of vegetables, but so far the trucking interests have assumed no importance, except near the larger towns. Agriculture has been extensive, rather than intensive. In a state yielding heavy crops of wheat and other cereals, with a soil so rich that commercial fertilizers are not thought of and barnyard manure so little considered that many farmers prefer to move their barns rather than their manure heaps, and with the burning of straw a common practice, the hoe is rarely seen; gang and sulky plows, self-binders and riding cultivators are the more favored implements. In the course of time, with the increase in population, will come a change in methods. Eastern farmers and gardeners find that the soil and climate demand decided modifications of eastern practices. The list of hardy trees and shrubs would be much longer were it not for the fact that the severest freezing often comes when the ground is bare.

The State Agricultural College at Brookings is a flourishing institution, the annual attendance being about five hundred. The United States Experiment Station is in connection with the college and is busy with the problems presented in a new state. Farmers' institutes and home reading courses are provided to help in the dissemination of agricultural knowledge.

The South Dakota State Horticultural Society is composed of the amateur and professional fruitmen of the state and is an earnest body of workers striving to solve the problems presented to prairie horticulturists. No state appropriation has been granted hitherto, so that the proceedings at present are published from time to time in the agricultural press of the state. The twelfth annual meeting was held at Sioux Falls, January 22–24, 1901.

The dry climate is very salubrious, and many people suffering from poor health in warmer and moister sections find relief here.

N. E. HANSEN.

SOUTHERNWOOD (*Artemisia Abrotanum*, which see for botanical account) is a European herb, aromatic, much branched, woody-stemmed, rather tender, perennial, 3–5 ft. tall, with pale green or grayish often variegated leaves, small yellowish flowers and minute seeds. Fig. 2357. It is occasionally found in family gardens, where it is grown from seed (or more often from its easily rooted cuttings, which are most readily obtained in early summer) for its pleasant taste and tonic properties, which resemble those of wormwood. It is seldom offered by seedsmen in this country because of its slight importance. M. G. Kains

SOW BREAD. An old name for *Cyclamen.*

SOY BEAN (*Glycine hispida*, which see for botanical description) is a legume, and while it has long been a staple crop in Japan it has but somewhat recently been cultivated in the United States. Figs. 191, 195. It grows to perfection only in a tropical or semitropical climate. In its native country, Japan, the seed is an important human food product, but in the United States its principal use at present is as a forage plant for farm live stock and as a soil renovator. It is an upright, leafy, branching plant, growing 3–4 ft. high. Two distinct plants are often called Soy Bean; the smaller one (*Phaseolus radiatus*) is grown principally in Japan; the larger species, the true Soy Bean, is *Glycine hispida*. This latter species has become popular in some sections of the United States because of its power of resisting drought and for the further reason that it may supply a large amount of forage rich in protein. In the northern states it is probable that the Soy Bean will be acclimated and that it will serve as an adjunct to the maize crop as a food for stock, although it is coarse in leaf and stalk.

2357. Southernwood (X ½).

It thrives best upon a warm, well-drained loamy soil, and seed should not be planted until all danger from frost is over. The land should be prepared by plowing and harrowing in the early spring, and the harrow should be used two or three times before the seeds are planted. Best success is attained by planting in drills, rows to be from 2½–3 ft. apart and the hills in the row 18–20 in. apart. During the early periods of growth cultivation should be frequent, preferably with a fine-toothed implement. After the plants have grown so that the ground is well shaded the tillage may be discontinued. It is doubtful whether the curing of the plants for hay will ever come into general practice, but the crop may be largely grown for green soiling and for ensilage purposes. It may be cut into the silo with corn and serves to improve the quality of the food.

To the horticulturist the Soy Bean is valuable chiefly as a soil renovator. The soil of the orchard can be given clean culture during the early summer and the Soy Beans may be sown broadcast about July 1 and harrowed in. One bushel of seed per acre will be required. One bushel of rye per acre should be sown at the same time, for when the beans are killed down by the frost in the fall the rye will then serve as a cover-crop during the winter. When the soil is so hard and unforbidding that clover will not thrive the Soy Bean may be made to serve as a nitrogen-gatherer, and when plowed under it serves to greatly improve the physical condition of the land. See also *Glycine.* L. A. Clinton.

SPANISH BAYONET. See *Yucca.*

SPANISH BROOM. *Spartium junceum.*

SPANISH LIME. *Melicocca bijuga.*

SPANISH OYSTER PLANT. *Scolymus.*

SPARÁXIS (Greek word referring to the torn or lacerated spathes, a character which distinguishes this genus from Tritonia). *Iridàceæ.* Wand Flower. Sparaxis is a group of spring-blooming "Cape bulbs" of the Ixia tribe, with spikes of 6-petaled, more or less funnel-shaped flowers one inch or two across and exhibiting an extraordinary range of color and throat markings. These plants are less popular than Ixias, which they much resemble. The plants are dwarfer and more compact than Ixias, usually 6–12 in. high, the spikes are shorter and fewer-flowered, and the blossoms are sometimes larger. Sparaxis is essentially distinguished from Ixia and other allied genera by the subregular perianth, unilateral and arcuate stamens, and scarious, lacerated spathe-valves. Other general features are: the rootstock a corm; lvs. linear or lanceolate and arranged in a basal rosette; inflorescence a simple or panicled spike; perianth-tube short: ovary 3-celled; ovules many, superposed. Sparaxis is native to the southwestern provinces of Cape Colony, S. Africa.

Although a few plants of Sparaxis are occasionally cultivated in America by bulb fanciers, one may search through many American catalogues without finding them listed. The Dutch bulb growers offer 25 distinct kinds, which is perhaps a quarter of the number of varieties of Ixias in cultivation. According to J. G. Baker, there is "only one species in a broad sense, varying indefinitely in the size and coloring of the flowers." For practical purposes Baker recognizes the 3 species given below; of these the most important and variable is *S. tricolor.*

Sparáxis pulchérrima of the Dutch trade is properly **Dieràma pulchérrima,** Baker. This grows 6 ft. high or more and has pendulous fls. bright blood-purple but apparently with pale rose and perhaps other varieties (also a white var.). It is distinguished by its pendulous fls. with regular perianth, simple style-branches, equilateral stamens, and large bracts which are not laciniate. B.M. 5555. F.S. 17:1810. Gn. 20:315; 44, p. 281. This plant is said by F. W. Burbidge to be "perhaps the most graceful of all the Cape Irids."

A. *Throat of flower same color as segments.*
  B. *Fls. small: segments ½–¾ in. long* ....1. **bulbifera**
  BB. *Fls. larger: segments 1 in. or more long* ....2. **grandiflora**
AA. *Throat of flower bright yellow, often with a dark blotch on the lower part of each segment*....................3. **tricolor**

bulbifera, Ker. Corm globose, ½–¾ in. thick: basal lvs. about 4, linear or lanceolate, ½–1 ft. long: stems ½–1 ft. long, simple or branched, bearing low down 2–3 small lvs., often with bulbils in the axils: fls. solitary or few in a spike, yellow; perianth-tube ½ in. long. B.M. 545 (*Ixia bulbifera*). To this species Baker refers *S. albiflora*, Eckl., with fls. whitish inside, and *S. violacea*, Eckl., with dark purple fls.

grandiflòra, Ker. Habit, corm, lvs. and spathe just as in *S. bulbifera* but the fls. larger, the limb 1 in. or more long, usually yellow or purple, and larger anthers. B.M. 779 (fls. primrose inside, flamed purple outside). B.R. 3:258 (fls. white inside, midvein on the back purple). B.M. 541 (*Ixia grandiflora*. Fls. rich purple, margined lighter).—According to Baker, the principal named forms are: **atropurpùrea**, dark purple; **anemonæflòra**, pale yellow; **Liliàgo**, white, flushed with claret-purple outside; and **stellàris**, dark purple, the segments narrower than the type, oblanceolate and acute rather than oblong.

2358. Sparaxis tricolor. (× ⅛).

tricolor, Ker. Fig. 2358. Differs from *S. grandiflora* only in the color of the flowers, which are very variable but always have a bright yellow throat and often a dark blotch at the base of each segment. B.M. 1482; 381 (*Ixia tricolor*). F.S. 2:124. F. 1843:213 (*S. picta, purpurea, pulchella*).—According to Baker, this is the favorite species among cultivators. It certainly has the greatest variety of colors and markings. In the works cited the floral segments range from nearly white through rose, brick-red, carmine, crimson and light purple to dark purple, excluding blue and yellow, which latter color usually appears in the throat. W. M.

SPARGÀNIUM (Greek, *fillet;* referring to the ribbon-like lvs.) *Typhàceæ*. BUR-REED. Bur-reeds are marsh herbs closely allied to cat-tails but with fls. in globular heads instead of oblong spikes. Three hardy perennial kinds are advertised by collectors of native plants and one or two are procurable from specialists in aquatics. Bur-reeds are desirable only in bog gardens or in wild gardening operations. The beauty of these plants often lies in each species being massed alone, as well as in the mixing with other plants.

Sparganiums have creeping rootstocks and fibrous roots. Some are floating plants. Stems branched or not: lvs. linear, alternate, sheathing at the base: fls. monœcious, in globose heads, the staminate uppermost: fr. sessile or peduncled, mostly 1-loculed and nut-like.

A. *Inflorescence unbranched.*

simplex, Huds. Stems weak and slender, 1½–2 ft. high, unbranched: lvs. more or less triquetrous: staminate heads 4–6: pistillate 2–6, 5–8 lines in diam.: fr. stalked. June–Aug. N. Amer. B.B. 1:64.

AA. *Inflorescence branched.*

B. *Height 3–8 ft.*

eurycárpum, Engelm. Stems stout, 3–8 ft. high, branching: lvs. linear, flat, slightly keeled beneath: staminate heads numerous, pistillate 2–4 on a stem or branch, 10–16 lines in diam.: fr. sessile. May–Aug. N. Amer. B.B. 1:63.

BB. *Height 2–3 ft.*

ramòsum, Curt. Lvs. flat: heads 5–9, disposed in axillary and terminal, interrupted spikes, the lowest one larger and pistillate, the others wholly staminate: pistillate heads 8–10 lines in diam. July. Southern U. S., particularly in mountain bogs. W. M.

SPARMÁNNIA (after Andreas Sparmann, who visited the Cape with Thunberg). *Tiliàceæ*. About 5 species of African shrubs or trees with cordate, dentate or lobed leaves and white flowers in terminal, umbelliform cymes: sepals 4; petals 4, naked at the base; stamens several, free, the anther-bearing ones interior, the staminodia exterior: capsule globose or ovoid, spiny.

S. Africana is of easy treatment under glass in a temperature never lower than 35°, with plenty of air and light. The plants are benefited by being plunged in the garden during the summer and syringed during dry weather. Plants should be potted early in spring. The tips of young shoots root readily with 60° of heat.

A. *Lvs. deeply 5–7-lobed.*

palmàta, E. Mey. A slender shrub much smaller in all its parts than *S. Africana:* branches half herbaceous: lvs. on long petioles, the lobes long-acuminate, incisely sinuate and unequally toothed, prominently 5–7-nerved below: fls. white or purplish, densely arranged on the subterminal peduncles: capsule 4-celled. Cult. in S. Calif.

AA. *Lvs. not lobed.*

Africàna, Linn. A large shrub or tree, 10–20 ft. high: lvs. cordate-acuminate, 5–7-angled, unequally toothed, 5–6 in. long, 7–9-ribbed below: fls. white, on long, many-fld. peduncles: capsule 5-celled. B.M. 516. G.M. 37:233. R.H. 1858, p. 105. Gn. 45:967.—A useful greenhouse plant. Var. **flore plèno** is also grown. G.C. II. 19:477.

F. W. BARCLAY.

Sparmannia Africana is not common in S. California, but is highly esteemed. One in Singleton Court, 25 years old, is 12 ft. high and 16 ft. through, and consists of about fifty trunks ½–4 inches in diameter. It was in full bloom in January and February and one of the finest sights imaginable. It was literally covered with snowballs of 4 inches diameter, and admired by numbers of people. The blooms were so heavy that the ends of the branches touched the ground, necessitating severe pruning as soon as blooms were past beauty. No viburnum, hydrangea or other shrub can compare with it at its blooming season. During the remainder of the year it has the appearance of a clump of basswood suckers, the leaves being nearly identical in appearance with those of the basswood. It is therefore a dense mass of broad leaves and looks well anywhere and at any time. This is one of the finest white-flowered shrubs or trees in cultivation. The double variety is not as desirable as the single. ERNEST BRAUNTON.

SPARROW-GRASS. Provincialism for *Asparagus*.

SPARTÌNA (Greek, *spartine*, a cord; on account of the tough leaves). *Gramineæ*. Species 7. Perennial marsh plants of various parts of the world, most or all of which are found in the United States. Culms rigid and reed-like: lvs. coarse and rough, usually becoming rolled inwards: spikelets 1-fld., in rows on two sides of the triangular rachis; spikes 2–several in a raceme.

cynosuroides, Willd. FRESH-WATER CORD-GRASS. In the West known as "Slough-grass." A common coarse fresh-water marsh grass, occurring across the continent in the northern states. Recommended for cultivation along the margins of ponds and artificial lakes. Procurable from collectors. A. S. HITCHCOCK.

SPÁRTIUM (Greek *spartos*, the ancient name of the plant). Syn., *Spartiánthus*. *Leguminòsæ*. Ornamental shrub, with long and slender green branches, small and sparse foliage, and showy papilionaceous yellow fls. in terminal racemes. It is a handsome shrub especially adapted for warmer and drier regions; in the East it is probably hardy as far north as Philadelphia. It becomes naturalized easily, as happened in several localities in S. America, whence it was afterwards described as *S. Americanum*, Meyen. It grows in almost any kind of well-drained soil and is well suited for planting on exposed sandy and rocky situations. Prop. by seeds and by greenwood cuttings under glass. One species in the Mediterranean region and the Canary Islands. Allied to Genista and Cytisus, but chiefly distinguished by the 1-lipped calyx: lvs. simple: fls. in terminal, loose racemes; calyx split above, hence 1-lipped, tip with 5 minute teeth; keel incurved, acuminate: pod linear, compressed, many-seeded; seeds with callose appendage at the base like in Genista. The slender branches yield fiber, which is used in S. France and Spain for making ropes, cords and cloths. Many species of Cytisus and Genista were formerly referred to this genus. For *Spartium Ætnense*, Biv., *S. ferox*, Poir., *S. monospermum*, Linn., *S. radiatum*, Linn. and *S. virgatum*, Ait., see Genista; for *S. purgans*, Linn., and *S. scoparium*, Linn., see Cytisus; *Spartium multiflorum*, Ait.=Cytisus albus.

júnceum, Linn. (*Genista júncea*, Lam. *Spartiánthus júnceus*, Link.). SPANISH BROOM. Upright shrub, 10 ft. high, with slender, terete, green, rush-like branches sparingly leafy or almost leafless: lvs. oblanceolate to linear, entire, bluish green and sparingly appressed pubescent, ½–1½ in. long: fls. fragrant, yellow, about 1 in. long, with ample standard: pod linear, pubescent, 2–3 in. long. June–Sept., in Calif. blooming almost the whole year. B.M. 85. B.R. 23:1974 (as *S. acutifolius*). Gn. 22, p. 404; 34, p. 284; 44, p. 57.—There is a double-fld. form.

ALFRED REHDER.

SPATHIPHÝLLUM (Greek word, referring to the leaf-like spathes). *Aràceæ*. About 20 species of nearly stemless plants, mostly from tropical America, with large, oblong or lanceolate, acuminate or cuspidate, long-petioled leaves and flowers on a long-peduncled spadix subtended by an oblong or lanceolate, leaf-like, white, persistent, flat spathe: stigma 3–4-lobed: ovules in each locule 2–8, fixed at the interior angles of the cells. Gardeners recommend as soil for their culture a mixture of leaf-mold, peat and fibrous loam, together with some sand and charcoal.

A. *Spathe less than 4 in. long.*

B. *Lvs. 2–3 in. wide.*

floribúndum, N. E. Br. Petioles 4–6 in. long; leaf-blade oblong-elliptical or oblong-lanceolate, very sharply acuminate, abruptly obtuse and contracted into a node at the base, dark green above, lighter beneath: spathe oblong-lanceolate, long-cuspidate-acuminate, about 2½ in. long by 1 in. wide. white; spadix white, a little shorter than the spathe. Colombia. I.H. 21:159. F. 1880, p. 76.

BB. *Lvs. less than 2 in. wide.*

C. *Scape thickened and curved below the spathe.*

cándidum, N. E. Br. Petioles 5–6 in. long, minutely speckled with white: leaf-blade narrowly oblong-lanceolate, 4½–6 in. long by 1–1¼ in. wide, acuminate at apex, base cuneately rounded, bright green above, paler beneath: spathe erect or spreading, according to amount of curve in scape, oblong-lanceolate, acuminate, 3½ in. long, 1 in. broad, white on both sides; spadix shorter than the spathe. Colombia. F. 1879, p. 19.

CC. *Scape straight.*

Pátini, N. E. Br. Petioles slender, terete, often much longer than the blade: leaf-blade long lanceolate, 6–8 in. long, acuminate at both ends: spathe oblong-lanceolate, very long-acuminate, white except for the green costa, spreading or recurved; spadix long stipitate (5 lines), a little shorter than the spathe. Colombia. I.H. 27:397.

AA. *Spathes over 4 in. long.*

B. *Petioles 20 in. or more long.*

cochlearispàthum, Engl. (*S. heliconiæfòlium*, Schott). A large plant: lvs. broadly oblong, 20–30 in. long, shortly acute, the base rounded or cordate: spathe ovate or oblong-ovate, narrowly cuspidate, somewhat decurrent on the peduncle, 8–12 in. long; spadix 3–4 in. long. Mexico. I.H. 21:189.

BB. *Petioles 5–10 in. long.*

C. *Spadix 3–5 in. long.*

cándicans, Poepp. (*S. cannæfòlium*, Schott). Leaf-blades broad-lanceolate to oblong-lanceolate, 10–16 in. long, acute or acuminate, base somewhat cuneate, acute, deep green above, paler beneath: spathe 4½–7 in. long, oblong-lanceolate, acuminate, white on the face, green, possibly rarely white, on the back: fls. odorous. West Indies, Colombia. B.M. 603 (as *Pothos cannæfolius*).

CC. *Spadix 2 in. long.*

hýbridum, N. E. Br. A hybrid between *S. candicans*, Poepp., and *S. Patini*, N. E. Br. Petioles 6–8 in. long; leaf-blades broadly lanceolate to oblong-lanceolate, acuminate, 8–9 in. long: spathe white on both sides, lanceolate, acuminate, 4–5 in. long; spadix 2 in. long. I.H. 29:450. G.C. II. 19:500.

F. W. BARCLAY.

SPATHOGLÓTTIS (Greek, *spathe* and *tongue;* said to refer to the shape of the lip). *Orchidàceæ*. Plants agreeing with Bletia in habit and form of inflorescence: pseudobulbs broadly conic, 1–3-lvd.: lvs. elongate, long-petioled, narrow, plicate, articulated: scape lateral, bearing large fls. in a terminal raceme: sepals free, subequal; petals similar or broader and longer; labellum not spurred, lateral lobes somewhat convolute, middle lobe clawed; column slender: pollinia 8. About 10 species in Asia, Australia and the Malay Islands.

Spathoglottises grow best at the warm end of the Cattleya or Brazilian house in a moist, shady location. Pot culture suits them best, and the compost should consist principally of equal parts peat fiber and sphagnum moss with a little chopped sod added; about one-half of the pot should be devoted to drainage. They all require a liberal amount of water when growing, but only enough to keep them in sound condition when at rest. They are rather hard to increase by division and the supply depends upon new importations.

2359. Spathoglottis Vieillardi. (× ½.)

plicàta, Blume. Lvs. 2–4 ft. long, finely acuminate, scape 2–3 ft. high, with a raceme 6–12 in. long: fls. 1 in. across, lilac; sepals and petals broad, acute; middle lobe of the labellum long and narrow, cuneately dilated at the tip; calli yellow, villous. Malay Peninsula.

aùrea, Lindl. (*S. plicàta*, Griff.). Lvs. 12–18 in. high, narrowly lanceolate: scape tall and stout, 2 ft. high: raceme 6–8 in. long: fls. 1½ in. across, golden yellow; sepals broad, obtuse; middle lobe of the labellum equaling the falcate lateral lobes, narrowly lanceolate. Malay Peninsula. G.C. III. 4:93.—The lip varies, being sometimes broad and retuse at the apex.

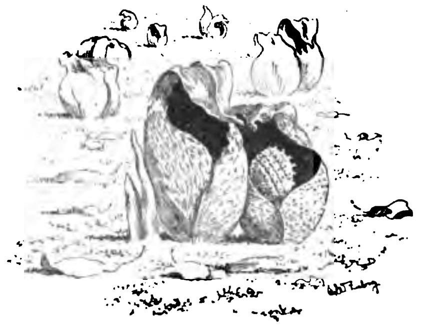
Vieillárdi, Reichb. f. (*S. Augustòrum*, Reichb. f.,. Fig. 2359. Lvs. long-lanceolate, acuminate, 1–2 ft. long: scape 12–18 in. high, robust: raceme 6 in. long, broad, corymb-like at first: fls. 2 in. across, very pale lilac, nearly white; sepals and petals ovate-oblong, subacute; labellum as long as the sepals, lateral lobes orange-brown, with orange calli speckled with red, middle lobe narrow, with a broadened tip variable in form. New Caledonia. B.M. 7013. A.G. 12:93. A.F. 6:631.—*S. aureo-Vieillárdi*, Hort , is a hybrid between this and *S. aurea*. Fls. pale chrome-yellow, with the sepals slightly and the petals profusely dotted with crimson. the tips of the lobes of the lip rich crimson. G.C. III. 23:309. G.M. 41:308.

S. Kimballiàna, Hook., is often regarded as a variety of S. aurea, from which it differs in having the backs of the sepals mottled with red-brown, the crest glabrous, and narrower lvs. B.M. 7443.—*S. plicàta*, var. *Micholitzii*, is advertised by Sander. Fls. amethyst color, with the segments broader than in the type. Habit more dwarf.

Heinrich Hasselbring and R. M. Grey.

SPATHYÈMA (Greek; referring to the spathe). *Aràceæ*. Skunk Cabbage. Skunk Cabbage is an exceptionally interesting plant. In the East, it is the first wild flower of the year, though it is oftener considered a weed than a flower by those who have nothing but contempt for it. It is a hardy swamp-loving perennial herb which pushes up its fascinating hooded spathes in midwinter or even before the first of January in favored situations. The spathes are 3–6 in. high, usually grow in clumps, and the variation in their coloring is a never-failing delight. They are mottled with purplish brown and greenish yellow, the former color sometimes becoming bright red, the latter ranging from dark green to bright yellow. These spathes are produced several weeks before the leaves appear, and they inclose odd flowers which are described below in detail. Just when the Skunk Cabbage flowers is a matter of much debate; the stamens are generally out in February or March. The hoods retain their beauty for months. In April or May they decay and the strong-growing leaves soon attain a height of 1–3 ft. and a breadth of 1 ft. or more. All parts of the plant give a strong, skunk-like odor, but only when bruised. A young plant uprooted is a picturesque object. Its thick, horizontal rhizome emits great numbers of strong, fleshy, rope-like roots. The presence of the rank foliage of Skunk Cabbage is generally considered a sign of wet, sour soil unfit for gardening.

Skunk Cabbage is offered by a number of dealers in hardy plants, as also by collectors. There is a considerable demand for it outside of its native region, and particularly in England, where the "bog garden" idea has been developed and has the most supporters. Skunk Cabbage has made a strong impress upon American literature. Its hardiness and bravery have been celebrated by outdoor writers from Thoreau to the present day. The question of its pollination has been much discussed. It was long supposed to be pollinated by the action of the carrion flies which are attracted by its odor. However, Trelease has shown that the bees are busy with the pollen while the plant is in flower and that the carrion flies mostly come later. Skunk Cabbage has long been known as Symplocarpus, but this name must give way to the older one given by Rafinesque.



2360. Skunk Cabbage, as the hoods come up in spring.—Spathyema fœtida (× 1-5).

Generic characters: spadix globose or oblong, entirely covered by fls., the ovaries of which are embedded in the spadix; perianth of 4 hooded sepals; anthers 2-celled; style pyramidal, 4-sided: ovary 1-loculed, with a solitary, suspended, anatropous ovule; berries in large heads, 1-seeded. Only one species.

fœ́tida, Raf. (*Symplocárpus fœ́tidus*, Nutt.). Skunk Cabbage. Fig. 2360. Lvs. numerous, 1–3 ft. long, 1 ft. wide, ovate, strongly nerved: spathe preceding the lvs., colored as described above: fr. ripe Aug., Sept. Nova Scotia to Minn., south to Fla. and Iowa. B.M. 836 (*Pothos fœtida*); 3224. V. 23:186. G.W.F. 27. D. 277. A.G. 14:367. B.B. 1:363.—The Siberian plant is probably the same species.

W. M.

SPATTER-DOCK. *Nuphar advena.*

SPEARMINT. See *Mentha.*

SPEAR-WOOD. *Eucalyptus doratoxylon.*

SPEARWORT. Certain species of *Ranunculus.*

SPECULÀRIA (from *Speculum Veneris*, meaning Venus' Looking-glass). *Campanulàceæ*. Venus' Looking-glass (*Specularia Speculum*) is a pretty little hardy annual herb with 5-lobed blue flowers not quite an inch across. The plants grow about 9 in. high, bloom in spring and summer and are desirable for edging flower beds. They are of easy culture. See *Annuals.*

Specularia is a genus of about 7 species closely allied to Campanula but differing by the very long calyx-tube, ovary and capsule. The long calyx-tube is one of the most conspicuous features of the plant and has perhaps served to suggest the handle of the mirror. There is one North American species, *S. perfoliata*, which differs from all the rest in having perfoliate lvs. and the capsule dehiscing laterally near the middle instead of near the calyx-lobes. It is a weed. The others are Old World herbs, small and annual, with the lower lvs. obovate and entire, the upper ones ovate-oblong or lanceolate and nearly entire. Calyx-tube linear, 1 in. or so long: limb 5-parted, the segments linear and as long as the corolla-lobes; corolla nearly wheel-shaped or broadly bell-shaped; stamens free from corolla: ovary 3-loculed: stigma shortly 3-lobed.

A. *Peduncles about 3-fld.*

Spéculum, DC. (*Campánula Spéculum*, Linn.). Venus' Looking-glass. Fig. 2361. Erect, 9 in. high: calyx glabrous or pubescent, the tube constricted at the apex; lobes finally reflexed, according to DeCandolle. Europe. B.M. 102.—Var. **procúmbens** is offered abroad in addition to white, lilac and double forms. R.H. 1897, p. 254.

AA. *Peduncles 1-fld.*

pentagònia, DC. Calyx pilose, lobes spreading. Asia Minor. B.R. 1:56.—This species is not now advertised in America. Some specimens have narrow lvs. and longer calyx-tube than *S. Speculum*. An interesting feature of this species (and perhaps others) is the 5-angled flower-buds.

W. M.

SPEEDWELL. *Veronica.*

SPELT. See *Triticum.*

SPÉRGULA (Latin *spargere*, to scatter; the seeds are said to be expelled). *Caryophyllàceæ*. A genus of 3–8 species of annual herbs including Spurry, which see, a forage plant adapted to poor, dry, sandy soils. It is a common weed in cultivated lands. It grows about 6 in., has linear lvs. which appear to be whorled, and bears numerous, small, white, 5-petaled fls. in summer. The fls. are about ¼ in. across and borne in terminal panicles. Important generic characters of Spergula are the small, scarious stipules, 5 styles, alternating with the sepals, and capsule-valves opposite the sepals.

Some of the species are dichotomously branched, but the following has clusters of branches originating at or near the base.

arvénsis, Linn. Spurry, which see. Annual, 6–18 in. high, branched at or near the base: lvs. linear, clustered at the nodes in 2 opposite sets of 6–8 together, appearing as if verticillate: stipules small, connate. Eu. B.B. 2:36.
W. M.

2361. Venus' Looking-glass — Specularia Speculum (× ½).

SPHÆRÁLCEA (Greek words, *globe mallow;* referring to the fruit). *Malvàceæ.* Globe Mallow. About 25 species of tender herbs, subshrubs and shrubs, mostly native to the warmer parts of America: lvs. usually angled or lobed: fls. solitary or clustered, axillary, in terminal racemes or spikes, violet, rose, flesh-color or various shades of red: bractlets 3, free or united at the base; calyx 5-cut: locules of the ovary numerous, 2–3-ovuled, arranged in a single whorl. Closely allied to Abutilon but with 3 bractlets instead of none.

A. *Lvs. 5–7-lobed.*

B. *Fls. in spikes.*

acerifòlia, Torr. & Gray. Perennial herb, 2–6 ft. high: lvs. 3–4 in. long, cordate, palmately 5-lobed (sometimes with 2 or more basal lobes), coarsely serrate: fls. rose-color, varying to white, 2 in. across, 15 or more in spicate clusters terminating the branches. Rocky Mts. B.M. 5404.

BB. *Fls. in umbels.*

umbellàta, Don. Mexican shrub, 3 ft. or more high, with scarlet, pendulous fls., about 1½ in. across, and usually 3 in an umbel: lvs. cordate, 7-lobed, crenate. L.B.C. 3:222 and B.R. 19:1608 (as *Malva umbellata*).—Var. **tricolor**, Hort., was said by John Saul to have reddish purple fls. striped with white and rose.

AA. *Lvs. 3-lobed.*

B. *Fls. scarlet or rose.*

Munroàna, Spach. Perennial herb, 1–2 ft. high: lvs. broad at base, obscurely 3-lobed, crenate, sometimes incised: fls. scarlet or rose, 1 in. across, rose-colored: panicles axillary and terminal, numerous. Dry plains, Brit. Col. to Idaho and south. B.M. 3537 and B.R. 16:1306 (both as *Malva Munroana*). A.G. 11:539.—Advertised in 1890 as the Sunset Plant. E. S. Carman said the same plant was offered in some catalogues as *Malva miniata.*

BB. *Fls. brick-red.*

cisplàtina, A. St. Hil. (*S. miniàta*, Spach. *Málva miniàta*, Cav. *M. miniàta*, Jacq. [?]). Tender branching subshrub, 2–4 ft. high, formerly considered desirable for conservatory decoration in October and November, when it produces its brick-red flowers: lvs. 1–2 in. long, 3-lobed, coarsely and unequally crenate, midlobe longest: fls. 1–1¼ in. across, in axillary, few-fld. cymose racemes. La Plata. The above description from B.M. 5938.—Miniata means cinnabar-red, the color of red lead. There seems to be no reason why *Sphæralcea cisplatina* and *Munroana* should be confused. The lvs. of Munroana are obscurely 3-lobed, the lobes broad, blunt and short; the lvs. of *S. cisplatina* are deeply and sharply cut, acuminate and narrowed towards the base, the lobes narrow and acute, the midlobe over twice as long as the side lobes. The color of the fls. is very distinct and the clusters are branched in *S. Munroana* but not in *S. cisplatina.*
W. M.

SPHÆRÓGYNE (Greek words referring to the globose stigma). *Melastomàceæ.* This genus has been referred to *Tococa*, which see for *S. latifolia.* The handsome foliage plant known to the trade as *Sphærogyne imperialis* is mentioned under this head because its fls. and fr. seem to be undescribed, and the place of the plant in the vegetable kingdom is therefore undetermined. It is a broad-leaved hothouse plant with strong parallel ribs, metallic green above and purplish brown beneath. For cultural suggestions, see *Miconia.*

GENERAL LIBRARY UNIV. OF MICH.

imperiàlis, Linden. Stem simple or little branched, erect, robust: lvs. opposite, decussate, oval, with 5 longitudinal ribs running from base to apex and many parallel transverse veins connecting them. Peru. I.H. 24:284.—Native of Peru, and introduced to Europe by Linden in 1871. It is said to be easily grown in a warm house.

SPHAGNUM. Sphagnum moss, bog moss or peat moss is found in swamps or bogs and is one of the plants from which peat is formed; it is much used by gardeners. Its geographical distribution extends to all countries in the north temperate zone. According to Braithwaite's "Sphagnaceæ of Europe and North America," there are 19 distinct species to be found in North America, besides numerous varieties. Sphagnum mosses differ from the true mosses so much that they are usually classified in a distinct family, Sphagnaceæ. Besides some slight differences in the reproductive organs, the chief differences lie in the larger growth of Sphagnum (which is often a foot or more in height), its soft appearance, pale green color, and the absence of root-hairs. The stems and leaves are inclosed or encircled by one, two and often four strata of transparent cells connected with each other by small holes, which have the capacity of sucking up and retaining a large amount of water. These cells therefore perform the function of root-hairs, and it is this abundant water-storage tissue that makes Sphagnum moss of so much use to gardeners in the cultivation of orchids, Anthurium, etc., and in fact most plants of an epiphytal or swamp-loving character, such as Sarracenia, Darlingtonia, etc. Sphagnum often forms at least one-third of the compost in which pitcher plants and epiphytes are grown. The fresh green tips of Sphagnum are also most useful for surfacing pots of orchids and other plants. Besides giving them a better appearance, the moss acts as an index to the moisture condition of the plant. Sphagnum is also useful in the propagation of many stove plants, such as Cordyline, Nepenthes, etc.; for starting tropical tuberous-rooted plants, such as fancy caladiums; for sowing seeds of orchids, Anthuriums, Nepenthes and Sarracenias when fresh and chopped fine; as a mulch; as a non-conducting material for plants in pots in exposed positions in summer; and in packing plants for transportation, for which purpose it is an ideal material. Owing to its sponge-like character it may be used wet or dry, according to the character of the plants intended for packing.

Unless one has an ideal position in which to keep Sphagnum moss after gathering it from its native place, or unless one has conditions very similar to its native habitat, it is difficult to keep it living for any length of time. This does not greatly matter, except that Sphagnum used for surfacing pots should always be living for the sake of appearance. That which is used in potting and propagating need not necessarily be living as long as it is fresh and not decayed, while partially decayed moss may be used for mulching and packing.

EDWARD J. CANNING.

SPHENÓGYNE. See *Ursinia.*

SPICE BUSH. Consult *Benzoin.*

SPIDER FLOWER. *Cleome.*

SPIDER LILIES. *Hymenocallis* and *Pancratium.*

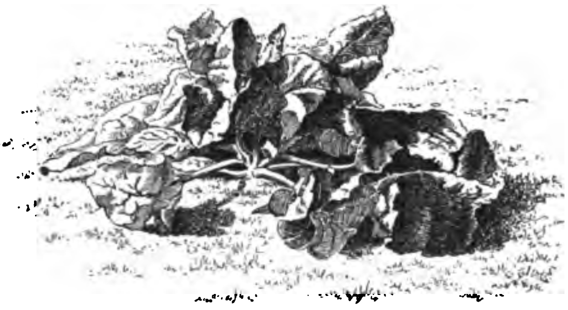
SPIDER PLANT. See *Cleome.*

SPIDERWORT. *Tradescantia.*

SPIGÈLIA (after Adrian von der Spigel, physician, 1558–1625). *Loganiàceæ.* About 35 species of American annual or perennial herbs, rarely somewhat woody, with opposite, membranous, feather-veined, rarely 3–5-nerved leaves, and long or small red, yellow or purplish flowers, usually borne in terminal, one-sided, somewhat curved spikes: calyx 5-lobed; segments narrow; corolla tubular; lobes 5, valvate; stamens 5, attached to the corolla-tube: ovary 2-loculed: style articulated, simple, obtuse or somewhat capitate and stigmatose at the summit: capsule flattened, circumscissile above the persistent base.

Marilándica, Linn. PINK ROOT. A handsome hardy perennial herb, with slender, tufted stems 1–2 ft. high, opposite, ovate, sessile, thin lvs. 2–4 in. long, and red, tubular fls. with yellow throats in terminal, 1-sided spikes. June, July. Woods, N. J. to Wis. and south. B.B. 2:605. B.M. 80.—An elegant plant for the hardy border. Shade is not necessary for its welfare if planted in good, loose, deep loam.

F. W. BARCLAY.



2362. Spinach (× ⅛).

SPIKENARD. *Aralia racemosa.* **FALSE S.** *Smilacina.*

SPILÁNTHES (Greek, *spotted flower*). *Compósitæ.* This genus includes the Pará Cress (*Spilánthes oleràcea,* Linn.), the leaves of which impart a pungent flavor to salads and stimulate the salivary glands. The plant belongs rather to pharmacy than to the vegetable garden. It is procurable from France. It is an annual herb of almost creeping habit and yellow fls. in conical, rayless heads about three-eighths of an inch in diameter. The seed is sown in early spring. The Brazil Cress differs in the brownish tint of stem and leaves. The preceding points are condensed from Vilmorin's "Vegetable Garden."

Spilanthes is a genus of about 20 species found in the warmer regions of the globe. They are mostly annual, rarely perennial, and have opposite, usually dentate lvs. Some have yellow or white rays and the disk is yellow. *S. oleracea* has broadly ovate, dentate lvs. and long-peduncled heads. Gn. 22, p. 295.

W. M.

SPINACH (*Spinacia oleracea,* which see) is an annual crop grown as a pot-herb, or for "greens." Fig. 2362. It is a cool-season plant, and therefore it is grown in fall and spring. It is a plant of easy culture, thriving in any good garden or field soil, although for quick results and for tender, succulent foliage, land which has an abundance of available plant-food, and particularly of nitrogen, is most desirable. The plant is hardy, and when the land is well drained, it will ordinarily stand the winter climate as far north as the city of New York, and still farther in somewhat protected places.

Spinach is grown both as a fall and spring crop. The fall crop is raised from seed that is sown in August; in eight weeks the leaves may be large enough for eating. The spring crop is grown from seeds sown in the fall, or from those sown during winter in hotbeds or coldframes, or from those sown directly in the ground as soon as it is fit in the spring. If the plants for spring use are to be started in the fall, the seeds should be sown about six to eight weeks before hard freezing weather is expected. Then the plants will have attained sufficient size and roothold to enable them to pass the winter. It is advisable to cover the plants, just before winter sets in, with straw or loose litter or dry manure. Even though the plants will withstand the winter, they nevertheless thrive better if given this protection, particularly in soils that are likely to heave. It is customary to grow this fall-sown Spinach on wide ridges or beds that are made by plowing several furrows together, leaving a dead furrow between them. This allows of surface drainage. These beds may be from five to ten feet wide. On these beds, the seeds are sown in rows running lengthwise, the distance between the rows being from 10 to 20 inches, depending upon the methods that are employed for tillage. If hand tillage alone is to be given, the plants may be placed closer. In the spring the cover is removed from the plants at the earliest opportunity, for Spinach is most desired very early in the season. Unless the land is in extra good "heart," it is well to make a surface application of a soluble fertilizer early in the spring in order to start the plants into growth. A fertilizer that is very rich in nitrogen gives best results; in fact, it is customary in some places to use a solution of nitrate of soda or sulfate of ammonia, applying the material with a sprinkling cart. From 50 to 75 pounds of the fertilizer may be used to the acre with very good results, at each of two or more applications.

For home use, Spinach is sometimes carried over the winter in frames, the plants having been transplanted to the frames or raised in them during the late fall. These frames are protected from severe freezing weathe by mats or shutters. Whenever it is desired to bring the plants into growth, sash is placed over the frame, and extra protection is given in very cold weather. The plants will soon become green and begin to make new leaves. Different frames may be covered at different times as the season advances, thereby providing a supply for home use. Sometimes the seed is sown in hotbeds that are made late in winter or very early in spring, and the plants are secured in advance of the ordinary season. The growing of Spinach in frames is less frequent than formerly, owing to the fact that the market is now supplied with the product grown in the Middle South.

Spring Spinach may be grown from seeds that are sown as soon as the land can be worked in spring. If the land has been plowed and manured in the fall, quicker results may be secured. Two or three sowings may be made in the home garden for spring use, but after the middle of June Spinach is likely to become tough and is in little demand. If Spinach is wanted during the summer, it is better to use the New Zealand Spinach, which is a warm weather plant. This plant has no relationship with the ordinary Spinach (see *Tetragonia*). It is usually best to sow Spinach seed where the plants are to stand, although it is sometimes transplanted into frames for home use. Care must be taken that the plants do not become checked or stunted, else they will tend to run to seed. If the seed is sown too late in spring, when hot weather is approaching, the root-leaves will be very few and the plant will quickly throw up flower-stalks. Spinach is always grown as a succession or companion crop, as it occupies the land for a small part of the year. There are very few insects and diseases that are generally troublesome.

Spinach is usually transported to market in barrels or crates. Plants are usually cut so that an inch or so of the root is left with them. All dirt is removed, as also all broken and dead leaves. The plants are packed tight. It is essential that the plants be dry before they are shipped.

There are several important varieties of Spinach. The large, broad-leaved varieties are most popular in the markets, such as the Viroflay and the Round-leaved. The prickly Spinach is considered to be the most hardy and is chiefly recommended for fall sowing. L. H. B.

SPINACH ORACH, or SEA PURSLANE (*Atriplex hortensis*) is also sometimes called Mountain Spinach.

SPINÀCIA (from *spina;* alluding to the spiny fruit). *Chenopodiàceæ*. SPINACH. SPINAGE. According to Volkens (in Engler & Prantl's Pflanzenfamilien), there are only two species of Spinacia, *S. oleracea*, Linn., the common Spinach, and *S. tetrandra*, Stev. The latter is an annual herb of the Asia Minor-Persian region, and is not in cultivation. *S. oleracea*, the Spinach, is probably native to southwestern Asia, but it is now widely cultivated. It is an annual herb, developing rather large, arrow-shaped root-leaves, and these leaves are eaten for "greens." Later in the season it sends up a branching flower-stem 2–3 ft. high, bearing axillary clusters of seed-like fruits. In one type these fruits are spiny: this is the form once described as *S. spinosa*, Mœnch, but which is not now considered to be specifically distinct. Whether the round-seeded or the prickly-seeded type is the original form of the Spinach is not known, but as a matter of nomenclature, Linnæus' *S. oleracea*, which is the oldest name, is held to include all forms.

Spinacia belongs to the atriplex tribe. The genus is distinguished from Atriplex in the fact that the pistillate flowers are bractless, whereas those of Atriplex are inclosed in a pair of enlarging calyx-like bracts. Spinacia is diœcious, bearing the flowers in small axillary clusters: stamens 4 or 5, in a 4–5-lobed calyx: ovary 1, with 4–5 styles or stigmas, in a 2–4-toothed calyx, this calyx hardening and inclosing the akene and often becoming horned on the sides and giving rise to "prickly-seeded" Spinach. The cultivated forms have developed much thicker and broader radical leaves, which are used for greens, often showing little of the halberd or sagittate shape. L. H. B.

SPINDLE TREE. *Euonymus.*

SPIRÀEA (ancient Greek name of a plant used for garlands, derived from *speira*, band, wreath; probably first used for the present genus by Clusius). *Rosàceæ*. Ornamental deciduous shrubs, with alternate, estipulate, simple and rather small lvs., and small white, pink or almost crimson fls. in showy umbels, corymbs or panicles. Many are hardy north; some of the best of them are *Spiræa arguta*, *Thunbergi*, *Van Houttei*, *pubescens*, *trilobata*, *bracteata*, *media*, *ulmifolia*, *alba*, *Douglasi*, *Menziesi*, *tomentosa*. *Spiræa blanda*, *Japonica* and *albiflora* require a sheltered position or protection during the winter, though *S. Japonica* and its allies, even if killed almost to the ground, will produce flowers on shoots of the same season. *Spiræa Cantoniensis*, *Blumei*, *Chinensis*, *canescens* and *bella* are more tender and not to be recommended for the North but are hardy or nearly hardy in the Middle States. *S. prunifolia* is hardy north of Boston and is half hardy as far north as Ottawa, Canada.

In regard to the flowering season, the Spireas can be divided into two groups. The first one contains the species of the section Chamædryon, with white flowers in umbels and blooming in spring, from April to June. The second group is composed of the sections Calospira and Spiraria, with white or pink flowers in corymbs or panicles appearing from June to fall. Some of the most important species, arranged according to their relative flowering time, are the following: Early-flowering Spireas—*S. Thunbergi*, *arguta*, *hypericifolia*, *prunifolia*, *media*, *Pikowiensis*, *pubescens*, *chamædryfolia*, *trilobata*, *Van Houttei*, *Cantonensis*, *bracteata*. Late-flowering Spireas—*S. bella*, *corymbosa*, *densiflora*, *canescens*, *Japonica*, *albiflora*, *salicifolia*, *alba*, *Menziesi*, *Douglasi*, *tomentosa*. The species of the second group do not produce their flowers all at once like those of the first group, but continue blooming for a longer time.

The Spireas are all medium-sized or low shrubs and well adapted for borders of shrubberies, as single specimens on the lawn or for rockeries. Especially the species of the early-flowering group possess a graceful habit and make effective single specimens, except perhaps *S. chamædryfolia* and *media*, which are somewhat stiffer and less handsome and produce suckers. *Spiræa canescens* has also the graceful habit of the first group. *Spiræa Japonica* and its numerous hybrids form mostly low, round bushes and are pretty as single specimens or in the border. *Spiræa alba*, *Douglasi*, *Menziesi* and *tomentosa* should be planted in shrubberies only and especially in situations where their spreading by suckers does no harm; they are sometimes used for low ornamental hedges. For rockeries *Spiræa decumbens*. *corymbosa*, *densiflora*, *bullata*, and some dwarf hybrids of *S. Japonica* are to be recommended.

The species of the section Chamædryon, and also *S. canescens* and *bella*, should be pruned as little as possible,—only thinned out and the weak wood removed,—while those of the sections Spiraria and Calospira can be pruned more severely if necessary, since they produce their flowers at the ends of the young shoots. Some of the early-flowering Spireas, especially *S. arguta*, *prunifolia*, *Van Houttei* and *S. Bumalda*, are sometimes forced.

The Spireas grow in almost any moderately moist soil, the Spiraria species being generally more moisture-loving; and *S. tomentosa* thrives well only in a peaty or sandy soil, while those recommended above for rockeries require a well-drained soil and sunny situation. Prop. by seeds sown in spring and covered only slightly with soil, or by hardwood or greenwood cuttings. The species of Chamædryon grow very well from greenwood cuttings under glass, while the Spirarias are usually raised from hardwood cuttings. The Calospiras seem to grow equally well in both ways. The Spirarias are also often prop. by division and by suckers.

About 50 species in the temperate regions of the northern hemisphere, in America south to Mexico. Lvs. simple, short-petioled, entire or serrate, sometimes lobed, without stipules: fls. in umbel-like racemes, corymbs or panicles, perfect, rarely polygamous; calyx cup-shaped or campanulate, 5-lobed; petals 5, rounded; stamens 15–60, inserted between calyx and disk; pistils usually 5, distinct, developing into follicles dehiscent along the inner suture, with several or rarely two minute, oblong seeds. Many species formerly included under Spiræa are now referred to other genera; see Physocarpus, Schizonotus and Sorbaria for shrubby species and Aruncus, Ulmaria and also Astilbe for the herbaceous ones. There is a monograph of Spiræa and the allied genera by Maximowicz in Acta Horti Petropolitani, vol. 6, p. 105–261 (1879) and a monograph of the cultivated species, with their numerous hybrids fully described by H. Zabel, Die strauchigen Spiräen der deutschen Gärten (1893). There is much horticultural literature on Spireas, for the plants are popular and the species are many. ALFRED REHDER.

The name *Spiræa* is often spelled *Spirea*. Whenever the generic and specific name are both used the digraph should be employed, thus: *Spiræa Japonica*. Whenever one speaks of "Spireas" in an untechnical way, we spell the name without the digraph, in harmony with the Editor's writings. The name Spirea should be considered as an English word in common speech just as geranium and chrysanthemum are. In fact, many people speak of plants as "Spireas" which do not belong to the genus. For example, a delightful white-flowered bushy herb which is grown indoors in great quantities, especially at Easter, is properly an Astilbe. Comparable instances are peony, bougainvillea, etc. W. M.

KEY TO THE SECTIONS.

A. *Lvs. always entire: fls. in simple or panicled racemes: follicles usually 2-seeded.* (*Botryospira*, Zabel.)
B. *Plants tufted, suffruticose: fls. perfect, in usually simple racemes*.................
SECTION 1. PETROPHYTUM (Species not in cult.)
BB. *Plant an upright shrub with stout branches: fls. polygamous in panicled racemes*....
SECTION 2. SIBIRÆA (Species No. 1)
AA. *Lvs. usually serrate, rarely entire: fls. in umbel-like racemes, corymbs or panicles: seeds several.*
B. *Inflorescence a simple umbel-like raceme: fls. white.* ....
SECTION 3. CHAMÆDRYON (Species Nos. 2–20)
BB. *Inflorescence compound: fls white or pink.*
C. *Fls. in corymbs*.......................
SECTION 4. CALOSPIRA (Species Nos. 21–36)
CC. *Fls. in panicles*.......................
SECTION 5. SPIRARIA (Species Nos. 37–49)

INDEX.

acuta, 2.
acutifolia, 2.
adiantifolia, 13.
alba, 37, 44.
albiflora, 31.
alpina, 8.
Altaica, 1.
aquilegifolia, 13.
arbuscula, 36.
argentea, 21.
arguta, 4.
atrifolia, 20.
atrosanguinea, 27.
aubifolia, 20.
bella, 24.
Bethlehemensis, 45, 47.
betulifolia, 35.
Billardii, 47.
blanda, 16.
Blumei, 12, 13.
brachybotrys, 37.
bracteata, 11.
bullata, 26.
Bumalda, 30.
Californica, 47.
callosa, 27.
cana, 7.
Canadensis, 45.
canescens, 21.
Cantoniensis, 15.
carnea, 43.
carpinifolia, 45.
chamædryfolia, 20.
Chinensis, 17.
coccinea, 24.
confusa, 19.
conspicua, 38.
Constantiæ, 47.
corymbosa, 15, 33.
cratægifolia, 13, 33.
crenata, 2, 9.
crenifolia, 9.
crispifolia, 26.
cuneata, 21.
cuneifolia, 21.
decumbens, 22.
densiflora, 36.
Douglasi, 48.
eximia, 47.
expansa, 25.
flabellata, 2.
flagellata, 21.
flagelliformis, 21.
flexuosa, 20.
Fontanaysii, 37.
Fontanaysiensis, 37.
Fortunei, 27.
Foxii, 29.
glabrata, 27.
glabrescens, 19.
grandiflora, 43 and suppl.
hypericifolia, 2.
intermedia, 41.
Japonica, 27 and suppl.
Japonica alba, 31.
Japonica paniculata, 38.
Kumaonensis, 25.
lævigata, 1.
lanceolata, 15, 44.
latifolia, 45.
Lemoinei, 30.
Lenneana, 47.
leucantha, 31.
longigemmis, 23.
lucida, 34.
luxuriosa, 37.
macrophylla, 27.
Margaritæ, 28.
media, 11, 19.
Menziesi, 46.
multiflora, 5.
Nicoudierti, 10.
Nipponica, 11.
Nobleana, 42.
notha, 39.
nova, 16.
oblongifolia, 19.
obovata, 2.
ovata, 24.
pachystachys, 42.
paniculata, 38, 44.
Pikowiensis, 10.
procumbens, 22.
pruinosa, 37.
prunifolia, 6.
pubescens, 17, 18, 27.
pulchella, 25.
pumila, 30.
pyramidata, 40.
Reevesiana, 15.
Regeliana, 41.
robusta, 16.
rosea, 36.
rotundifolia, 11, 21,
ruberrima, 27, 30.
rupestris, 12.
salicifolia, 43, 44, 45.
Sanssouciana, 41.
semperflorens, 38.
sericea, 19.
Sibirica, 43.
superba, 32.
syringæflora, 38.
thalictroides, 2.
Thunbergi, 3.
tomentosa, 49.
triloba, 13.
trilobata, 13.
triumphans, 47.
truncata, 2.
ulmifolia, 20.
vaccinifolia, 21 and suppl.
Van Houttei, 14.
Virginiana, 34.

SECTION 1. PETROPHYTUM (Species not in cult.).

This section contains a few rather rare American species of which none is in cultivation. The best known is **S. cæspitòsa**, Nutt. (*Petrophytum cæspitòsum*, Rydb.), a dwarf cespitose subshrub, only a few inches high, with crowded, small, entire lvs. and small, whitish fls. in dense, usually simple racemes on slender stalks arising from the tufts of the grayish green foliage. It is very unlike any other Spirea and more resembles in habit a Saxifraga. It is perhaps better regarded as a distinct genus like the allied *Kélseya uniflòra*, Rydb. (*Eriogýnia uniflòra*, Wats.), and *Eriogýnia pectinàta*, Hook.

SECTION 2. SIBIRÆA (Species No. 1).

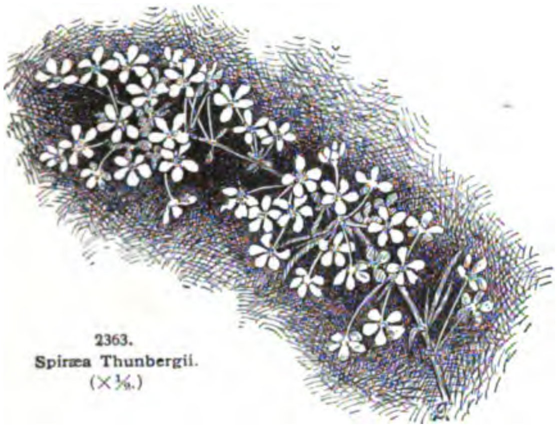
1. **lævigàta,** Linn. (*S. Altàica*, Pall. *Sibiræa lævigàta*, Maxim.). Shrub, 5 ft. high, with stout upright branches: lvs. cuneate-oblong, bluish green, glabrous, 1½–3½ in. long: fls. polygamous, greenish white in terminal panicles, 3–5 in. long, those of the staminate plant somewhat showier. May. Siberia.—Hardy.

SECTION 3. CHAMÆDRYON (Species Nos. 2–20).

A. *Fls. in sessile umbels, with none or very small lvs. at the base or only the lower umbels on leafy stalks.*
B. *Foliage entire or crenately dentate only near the apex, often 3-nerved, grayish green* ..... 2. **hypericifolia**
BB. *Foliage dentate or serrate, usually penninerved, bright green.*
C. *Shape of lvs. linear-lanceolate: glabrous*............ 3. **Thunbergi**
CC. *Shape of lvs. ovate to oblong-lanceolate: finely pubescent when young.*
D. *Umbels on the lower part of the branches stalked.*
E. *Lvs. oblong*............ 4. **arguta**
EE. *Lvs. obovate*........... 5. **multiflora**
DD. *Umbels all sessile, 3–6-fld.* 6. **prunifolia**
AA. *Fls. in umbel-like racemes on leafy stalks.*
B. *Margin of lvs. entire or crenate or dentate only toward the apex.*
C. *Foliage grayish pubescent on both sides*............ 7. **cana**
CC. *Foliage almost glabrous.*
D. *Shape of lvs. elliptic to oblong-lanceolate.*
E. *Lvs. penninerved: shoots angular*....... 8. **alpina**
EE. *Lvs. all or partly 3-nerved.*
F. *Shoots striped: lvs. all 3-nerved* .... 9. **crenata**
FF. *Shoots terete: lvs. partly penninerved, partly 3-nerved*....10. **Pikowiensis**
DD. *Shape of lvs. almost orbicular, ¾–1 in. broad*..11. **bracteata**
BB. *Margin of lvs. incisely serrate and often slightly lobed (only in No. 19 sometimes entire).*
C. *Stamens shorter than or as long as petals: sepals erect or spreading in fr.*
D. *Foliage glabrous.*
E. *Form of lvs. orbicular to ovate.*
F. *Apex of lvs. obtuse.*
G. *Lvs. penninerved, ovate* ....12. **Blumei**
GG. *Lvs. palmately 3–5-nerved, orbicular*.13. **trilobata**
FF. *Apex of lvs. acute*...14. **Van Houttei**
EE. *Form of lvs. rhombic-lanceolate*............15. **Cantoniensis**
DD. *Foliage pubescent, at least beneath.*
E. *Umbels and follicles pubescent.*
F. *Tomentum grayish*..16. **blanda**
FF. *Tomentum yellowish*.17. **Chinensis**
EE. *Umbels and follicles glabrous*.............18. **pubescens**
CC. *Stamens longer than petals: sepals reflexed.*
D. *Shoots terete, often pubescent in fruit*............19. **media**
DD. *Shoots angular, glabrous*.20. **chamædryfolia**

2. **hypericifòlia,** Linn. Vigorous shrub, 5 ft. high, with slender arching or upright branches: lvs. almost sessile, cuneate-obovate to obovate-lanceolate, 3-nerved or with few lateral veins, almost glabrous, ¾–1½ in. long: fls. small, white, in sessile umbels; pedicels usually pubescent; petals almost orbicular, usually longer than stamens. April, May. S. E. Eu. to Siberia.—Variable species. Var. **acutifòlia,** Wenzig (*S. acutifòlia*, Willd. *S. hypericifòlia*, var. *acùta*, Ser.). Lvs. nar-

rower, oblanceolate: fls. smaller, yellowish white; pedicels glabrous; petals obovate, shorter than stamens: flowers somewhat earlier, but less showy. Var. **flabellàta**, Zabel (*S. flabellàta*, Bertol. *S. hypericifòlia*, var. *crenàta*, Boiss. & Buhse). Lvs. obovate to obovate-lanceolate, acute, incisely serrate at the apex or entire on the flowering branches. Var. **obovàta**, Maxim. (*S. obovàta*, Waldst. & Kit.). Lvs. obovate, rounded at the apex, crenate above the middle. S. E. Eu. Var. **truncàta**, Zabel (*S. thalictroìdes*, Hort., not Pall.). Lvs. broadly obovate to oblong-obovate, truncate and crenately dentate at the apex. Siberia.



2363.
Spiræa Thunbergii.
(×⅓.)

3. **Thùnbergii**, Sieb. Fig. 2363. Shrub, 5 ft. high, with spreading or arching branches: lvs. sharply serrulate, 1–1¾ in. long: fls. pure white, about ⅓ in. across, in 3–5-fld. naked umbels; petals obovate, much longer than stamens: follicles with the spreading styles below the apex. April, May. China, Japan. S.Z. 1:69. G.F. 8:84, 85.—A very graceful early-flowering shrub, the slender arching branches clothed with feathery bright green foliage, turning late in fall to orange or scarlet. Almost hardy, but tips of branches sometimes killed by severe frost; valuable for seaside planting.

4. **argùta**, Zabel (*S. Thùnbergii* × *multiflòra*). Similar in habit to the former but higher and more vigorous: lvs. oblong-obovate to oblong-oblanceolate, sharply and sometimes doubly serrate, glabrous at length, 1–1¾ in. long: fls. pure white, ⅓ in. across, in many-fld. umbels, mostly with small lvs. at the base; pedicels glabrous; petals broadly obovate, almost twice as long as stamens. May. Of garden origin. G.C. III. 22:3. Gng. 7:291. F.E. 11:160. G.F. 10:443. M.D.G. 1900:16.—The most free-flowering and showy of the earlier Spireas; quite hardy.

5. **multiflòra**, Zabel (*S. crenàta* × *hypericifòlia*). Shrub, 5 ft. high, with slender, arching branches: lvs. obovate, cuneate, serrate above the middle, usually 3-nerved, glabrous at length, about 1 in. long: fls. pure white, in many-fld. umbels, sessile on the upper, borne on leafy stalks on the lower part of the branches. May. Of garden origin.—Handsome shrub similar to the former, but blooming a little later.

6. **prunifòlia**, Sieb. & Zucc. Graceful shrub, 6 ft. high, with upright slender pubescent branches: lvs. ovate to oblong, denticulate, pubescent beneath, 1–2 in. long: fls. pure white, about ⅓ in. across, on slender pedicels, in 3–6-fld. umbels; petals obovate, longer than stamens. May. China, Japan.—Var. **flòre plèno**. Fig. 2364. Fls. double, rather large. S.Z. 1:70. F.S. 2:153. Gn. 53, p. 185. A.G. 18:425. F.E. 9:593. Mn. 3, p. 42. Very handsome, early-flowering shrub, with dark green, shining foliage, turning orange in fall. The single-fld. form is less showy and rare in cult.; its foliage is lighter and not shining.

7. **càna**, Waldst. & Kit. Dense, bushy shrub, 3 ft. high: lvs. elliptic to oblong, acute at both ends, usually entire, grayish pubescent on both sides, more densely beneath, ⅓–1 in. long: fls. ¼ in. across, in dense head-like umbels; petals about as long as stamens; sepals reflexed in fruit. May. S. E. Eu., W. Asia.—Hardy, but not very showy.

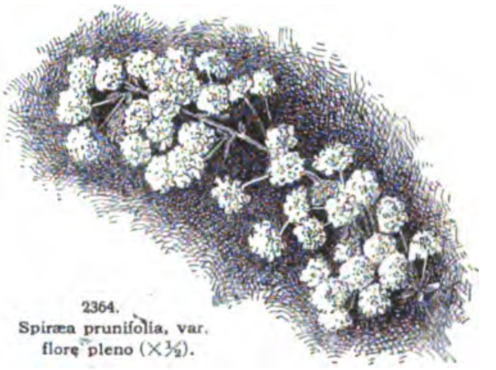
8. **alpìna**, Pall. Shrub, 4 ft. high, with upright or arching, angular, reddish brown branches: lvs. oblong-obovate to oblanceolate, acute, usually entire, glabrous, penninerved, ¼–1 in. long: fls. white, rather small, in short-stalked, small glabrous umbels; petals roundish, little shorter than stamens; sepals upright in fr.: follicles curving outward. May, June. N. E. Asia.—Hardy shrub, with graceful foliage.

9. **crenàta**, Linn. (*S. crenifòlia*, C. A. Mey.). Shrub, 3 ft. high, with slender striped branches: lvs. oblong-obovate to oblanceolate, acute at both ends, crenately serrate toward the apex, grayish green, puberulous beneath when young, 3-nerved, ⅓-1¼ in. long: fls. white, rather small, in dense almost semi-globose umbels; petals roundish obovate, shorter than stamens: sepals upright in fr.: follicles with erect styles. May. S. E. Eu. to Caucasus and Altai. L.B.C. 13:1252.—Hardy.

10. **Pikowiénsis**, Bess. (*S. crenàta* × *mèdia*. *S. Nicoudiérti*, Hort.). Shrub, 4 ft. high, with terete upright branches: lvs. oblong, cuneate at base, with few sharp teeth at the apex or sometimes entire, penninerved to 3-nerved, almost glabrous, 1–2 in. long: fls. white or greenish white, in many-fld. almost glabrous umbels; petals orbicular, shorter than stamens; sepals upright in fr.; follicles with the upright style somewhat below the apex. May.—Supposed natural hybrid, found wild in Podolia, in Poland.

11. **bracteàta**, Zabel (*S. Nippónica*, Maxim. *S. mèdia*, var. *rotundifòlia*, Nichols.). Shrub, 8 ft. high, with upright or spreading branches, quite glabrous: lvs. roundish obovate, usually crenate at the apex, dark green above, bluish green beneath, of firm texture, ¾–1¾ in. long: fls. over ⅓ in. across, in umbel-like racemes, sometimes compound at the base; petals orbicular, longer than stamens; sepals spreading in fr. June. Japan. G.C. II. 23:283.—Desirable hardy shrub of vigorous growth with showy umbels of pure white fls. and dark green handsome foliage remaining fresh until late in fall.

12. **Blùmei**, G. Don (*S. rupéstris*, Sieb.). Shrub, 4 ft. high, with spreading and arching branches: lvs ovate to rhombic-ovate, incisely crenate-serrate, pale bluish green beneath and rather prominently veined, ¾–1¾ in. long: fls. polygamous, white, in many-fld. umbels; petals roundish obovate, about as long as stamens: follicles with spreading or reflexed styles. June, Japan. B.H. 8:36.—Not hardy north, rare in cultivation; often the following or other species are met with under its names.



2364.
Spiræa prunifolia, var. flore pleno (×½).

13. **trilobàta**, Linn. (*S. trìloba*, Linn.). Fig. 2365. Shrub, 4 ft. high, with slender spreading branches: lvs. almost orbicular, incised-dentate and often 3-lobed, obtuse, pale bluish green beneath, ½–1 in. long: fls. pure white, in many-fld. umbels; sepals upright in fr.: follicles with ascending styles. May, June. N. China to Siberia and Turkestan, L.B.C. 13:1271. G.F. 1:452.—

Handsome bushy shrub, quite hardy; cult. under many different names as *S. aquilegifòlia, adiantifòlia, cratægifòlia, Blùmei.*

14. **Van Hoùttei**, Zabel (*S. Cantoniénsis* × *trilobàta. S. aquilegifòlia*, var. *Van Hoùttei*, Briot.). Fig. 2366. Shrub, 6 ft. high, with arching branches: lvs. rhombic-ovate or rhombic-obovate, rounded or somewhat narrowed at the base, acute, incised serrate, dark green above to pale bluish green beneath, ¾–1¾ in. long: fls. white, ⅓ in. across, in many-fld. umbels; petals twice as long as stamens; sepals upright or spreading in fruit. May, June. Of garden origin. Gn. 53, p. 251. G.F. 2:317. Gng. 5:210. A.G. 15:297. P.G. 3:173. M.D.G. 1900:17.—This is one of the most beautiful, or perhaps the most beautiful, of the early-blooming Spireas and quite hardy. Sometimes confounded with the foregoing, which is similar but smaller in every part and less showy.

15. **Cantoniénsis**, Lour. (*S. Reevesiàna*, Lindl. *S. lanceolàta*, Poir. *S. corymbòsa*, Roxb.). Shrub, 4 ft. high, with slender, arching branches: lvs. rhombic-lanceolate, incisely doubly serrate, dark green above, pale bluish green beneath, 1–2½ in. long: fls. over ⅓ in. across, in rather dense umbels; sepals upright in fruit: follicles with spreading styles. May, June. China, Japan. B.R. 30:10. A.G. 18:356.—Very handsome shrub, with large pure white fls., but only half-hardy north. Var. **flòre plèno**, with double fls. and narrower lvs., is still more tender. This species and the three foregoing are valuable also for their handsome foliage, which remains fresh and green until late in fall.

16. **blánda**, Zabel (*S. Chinénsis* × *Cantoniénsis. S. Reevesiàna robústa*, or *nòva*, Hort.). Upright shrub, 6 ft. high, with arching branches: lvs. oblong to ovate, acute at both ends, incised serrate, dark green and almost glabrous above, grayish tomentose beneath, 1–1⅓ in. long: fls. rather large, pure white, in pubescent umbels; sepals ovate-lanceolate, upright in fruit: follicles pubescent, with spreading styles. May, June. Of garden origin.—Only half-hardy north.

17. **Chinénsis**, Maxim. (*S. pubéscens*, Lindl.). Upright shrub, 5 ft. high, with arching branches, tomentose when young: lvs. long-petioled, ovate, incisely serrate and sometimes 3-lobed, finely pubescent above, yellowish tomentose beneath, 1–2 in. long: fls. pure white, about ⅓ in. across, in pubescent umbels; sepals upright in fruit, ovate-lanceolate, tomentose like the follicles; styles terminal, spreading. May. China. B.R. 33:38.—Handsome, but not hardy north.

18. **pubéscens**, Turcz. Upright shrub, 6 ft. high, with slender, arching branches: lvs. similar to those of the foregoing species, but more grayish tomentose beneath and somewhat smaller, petioles shorter: fls. ¼–⅓ in. across, in glabrous umbels; sepals triangular-ovate, upright in fruit: follicles glabrous, with the spreading styles below the apex. May. N. China. G.F. 1:331.—Hardy north, and the large-fld. form as handsome as the foregoing species.

19. **mèdia**, Schmidt (*S. confùsa*, Regel & Kœrn.). Upright shrub, 5 ft. high, with terete branches, glabrous or pubescent when young: lvs. ovate to oblong, cuneate at the base, incisely serrate above the middle, almost glabrous or pubescent, 1–2¼ in. long: fls. in many-fld. rather long-stalked, umbel-like racemes; follicles with the spreading or reflexed styles somewhat below the apex. May. S. E. Eu. to Japan.—Var. **glabréscens**, Zabel. Almost glabrous. Var. **oblongifòlia**, Rehd. (*S. oblongifolia*, Waldst. & Kit.). Lvs. elliptic-oblong to oblong-lanceolate, narrowed at both ends, entire or with 1–3 teeth at the apex. Var. **serícea**, Regel (*S. serícea*, Turcz.). Lvs. pubescent on both sides.

20. **chamædryfòlia**, Linn. Shrub, 6 ft. high, with angular, glabrous branches: lvs. distinctly petioled, ovate to lanceolate, sharply and often doubly serrate, almost glabrous, bluish green beneath, 2–3 in. long: fls. in many-fld. umbels, the lower ones long-stalked, the upper ones often almost sessile: follicles with the styles upright and terminal. S. E. Eu. to Japan. —Var. **flexuòsa**, Maxim. (*S. flexuòsa*, Fisch.). Less high, with spreading more or less zigzag branches: lvs. narrower, sharply serrate above the middle. Siberia to Dahuria. Var. **ulmifòlia**, Maxim. (*S. ulmifòlia*, Scop.). Upright: lvs. ovate, incisely or doubly serrate from below the middle: fls. larger, about ⅓ in. across, appearing later. L.B.C. 11:1042. B.R. 15:1222. Both vars. are often cult.; they spread, like the preceding species, by suckers. Sometimes as *S. atrifolia* or *aubifolia* in gardens.

SECTION 4. CALOSPIRA (Species Nos. 21–36).

A. *Stamens as long as petals: lvs. small, ½–1 in. long: fls. white.*
B. *Height 3–6, occasionally 12 ft.*...21. **canescens**
BB. *Height about ½ ft*..............22. **decumbens**
AA. *Stamens longer than petals.*
B. *Corymbs on lateral branchlets along the branches of the previous year.*
C. *Winter-buds slender, longer than petioles*...............23. **longigemmis**
CC. *Winter-buds shorter than petioles.*
D. *Shoots angular: lvs. usually broadly ovate*.......24. **bella**
DD. *Shoots terete: lvs. usually ovate-lanceolate*..........25. **expansa**
BB. *Corymbs terminal on upright shoots of the year.*
C. *Inflorescence pubescent, rarely glabrous, very compound, besides the terminal corymb lateral ones blooming somewhat later appear beneath it, only weak branches with a single corymb.*
D. *Shrub 1 ft. or less high, with bullate lvs. less than 1 in. long*................26. **bullata**
DD. *Shrubs 1–5 ft. high, with larger lvs.*
E. *Branches terete.*
F. *Ripe follicles diverging* ....27. **Japonica**
FF. *Ripe follicles upright, straight.*
G. *Fls. pink* ....28. **Margaritæ**
GG. *Fls. whitish or blushed*...........29. **Foxii**
EE. *Branches more or less angular, rather stiff, almost glabrous.*
F. *Color of fls. pink, rarely whitish*......30. **Bumalda**
FF. *Color of fls. white* ....31. **albiflora**
CC. *Inflorescence usually glabrous, consisting of only one terminal corymb: follicles not diverging.*
D. *Sepals reflexed in fruit: petals orbicular* ....32. **superba**
DD. *Sepals spreading or half upright: petals oval to oblong.*
E. *Fls. white.*
F. *Corymb usually pubescent*..............33. **corymbosa**
FF. *Corymb usually glabrous.*
G. *Lvs. usually incised-serrate*......34. **lucida**
GG. *Lvs. usually crenately serrate*.....35. **betulifolia**
EE. *Fls. pink*................36. **densiflora**

21. **canéscens**, D. Don. Shrub, 6 or sometimes 12 ft. high, with spreading and arching branches: lvs. broadly oval to obovate, very short-petioled, crenately dentate above the middle, grayish green, pubescent beneath or sometimes almost glabrous at length, ⅓–¾ in. long: fls. white, rather small, in dense, semi-globose corymbs to 2 in. across, appearing very profusely along the branches; sepals upright or spreading in fr.: follicles villous, with the ascending styles a little below the

apex. July. Himal. Gn. 45, p. 49; 49, p. 421; 52, p. 28; 54, p. 48.—Very graceful and handsome shrub, but not hardy north. It occurs under very many different names in the gardens, as *S. argéntea, cuneàta, cuneifòlia, flagellàta, flagellifórmis, rotundifòlia, vacciniifòlia*, and others.

22. **decúmbens,** W. Koch (*S. procúmbens*, Hort.). Dwarf, procumbent shrub, about ½ ft. high, with ascending branches, glabrous: lvs. elliptic to oblong, acute at both ends, crenately serrate above the middle, glabrous, ⅓–1 in. long: fls. white, in small corymbs, about 2 in. across: follicles glabrous, with upright terminal styles. June. Tyrol. G.C. II. 11:752.—Pretty shrub for rockeries.

23. **longigémmis,** Maxim. Shrub, 4 ft. high, with slender terete branches, glabrous: axillary buds acuminate, longer than the petioles: lvs. ovate-lanceolate to oblong-lanceolate, incisely and doubly serrate, with glandular-tipped teeth, bright green, glabrous, 1½–2½ in. long: fls. white, in rather loose, 2–3-in. broad, pubescent corymbs; sepals spreading in fr.: follicles almost glabrous, with terminal spreading styles. June. N. W. China. G.F. 7:345.—Hardy.

24. **bélla,** Sims (*S. ovàta*, and *S. cóccinea*, Hort.). Shrub, 3 ft. high, with slender, spreading branches, angular and sparingly pubescent: lvs. broadly ovate to ovate, sharply and often doubly serrate, almost glabrous, whitish or bluish green beneath, 1–2 in. long: fls. polygamous, pink, in small corymbs, ½–2 in. across; stamens little longer than petals; sepals reflexed in fr.: follicles pubescent only at the inner suture, with spreading styles. June, July. Himal. B.M. 2426. L.B.C. 13:1268.—Only half-hardy north.

25. **expánsa,** Wall. (*S. bélla*, var. *expánsa*, Regel. *S. Kumaonénsis*, Hort.). Closely allied to the foregoing, more vigorous and upright, 6 ft. high, with terete branches tomentose when young: lvs. ovate-elliptic to ovate-lanceolate, acute at both ends, sharply serrate from the middle, usually pubescent on the veins beneath, 1½–3 in. long: fls. white or pale pink, in 1–4 broad corymbs: follicles pubescent, diverging. July. Himal.—**S. pulchélla,** Kunze (*S. Kumaonénsis*, Hort.), is supposed to be a hybrid of this and the foregoing species; it combines the broader corymbs of the latter with the brighter color of the first species, therefore handsomer than either parent; sometimes cult. as *S. expánsa rubra*, but there is also another hybrid of the same name. See *S. rubra* in suppl. list.

2365. Spiræa trilobata (×½). No. 13.

26. **bullàta,** Maxim. (*S. crispifòlia*, Hort.). Dwarf shrub, with strictly upright brown, villous branches: lvs. roundish ovate to ovate, very short-petioled, incisely serrate, thickish and bullate, almost glabrous, grayish green beneath, ⅓–¾ in. long: fls. deep pink, in small and dense corymbs, 1½–3 in. across. July, Aug. Japan. Gt. 35:1216.

27. **Japónica,** Linn. (*S. callòsa*, Thunb. *S. Fórtunei*, Planch.). Shrub, 4 ft. high, with upright branches glabrous or puberulous when young: lvs. ovate to oblong-lanceolate, acute at both ends or acuminate, doubly and incisely serrate, pale bluish green and usually glabrous beneath, 1–4 in. long: fls. small, pale to deep pink, in usually much compound and rather loose corymbs; sepals reflexed in fruit: follicles glabrous, diverging, with ascending styles. June, July. Japan to Himal. F.S. 9:871. B.H. 8:129. P.F.G. 2, p. 113.—Handsome shrub, with the young unfolding lvs. of a pretty purplish color; usually much cult. under the name *S. callosa*.

2366. Spiræa Van Houttei. No. 14.

Var. **Fórtunei,** Rehd. (*S. Fórtunei*, Planch. *S. callòsa*, Lindl., not Thunb.). Higher, with quite terete branches: lvs. 2–4 in. long, oblong-lanceolate, acuminate, sharply and doubly serrate, with incurved, callous-tipped teeth, rugose above, bluish white beneath: corymbs very compound, rather loose; disk none or very minute. This seems to be the Chinese form; the Japanese form grows less high, has smaller and broader, coarsely doubly dentate-serrate lvs., not rugose and less whitish beneath; the stems are slightly striped by the decurrent petioles and the inflorescence is less compound. Var. **atrosanguínea,** Hort. Fls. deep pink, in tomentose corymbs. Var. **rubérrima,** Hort. Fls. deep pink, in puberulous corymbs. Var. **macrophýlla,** Simon-Louis. Lvs. becoming 6 in. long, bullate: corymbs small. Var. **glabràta,** Nichols. (*S. glabràta*, Lange). Of more rigid habit: lvs. ovate, glabrous: fls. bright pink, in glabrous corymbs. Var. **pubéscens,** Regel. Lvs. pubescent on the veins beneath: corymb tomentose. Most of the other forms often enumerated as varieties are hybrids of this species.

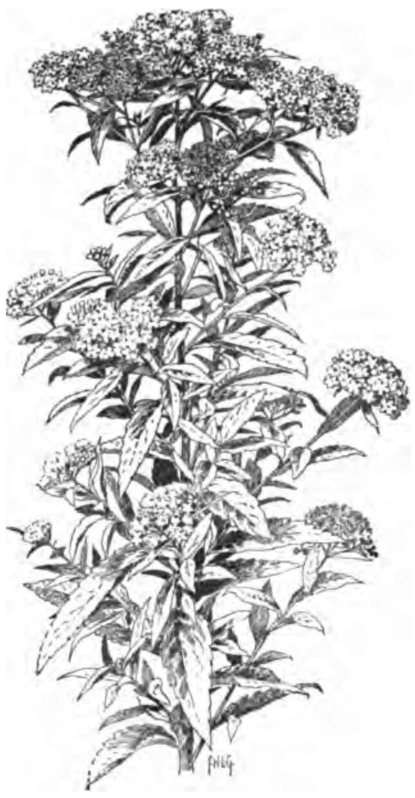
28. **Margaritæ,** Zabel (*S. Japónica* × *supérba*). Shrub, 5 ft. high, puberulous: lvs. ovate-elliptic to elliptic, coarsely and often doubly serrate, pubescent on the midrib beneath and pale green, 2–3 in. long: fls. rather large, bright pink, in broad corymbs; sepals spreading in fruit: follicles upright, glabrous, with upright styles: July, Aug. Of garden origin.—Handsome, very free-flowering form.

29. **Fóxii,** Zabel (*S. corymbòsa* × *Japónica*). Similar to the preceding: branches more or less striped, almost glabrous: lvs. elliptic, doubly serrate, glabrous: fls. whitish or pinkish, in large, puberulous corymbs; styles spreading in fruit. June, July. Of garden origin.—Less desirable than the preceding hybrid.

30. **Bumálda,** Burvenich (*S. Japónica* × *albiflora*. *S. pùmila*, Zabel). Shrub, 2 ft. high, rarely higher: lvs. ovate-lanceolate, sharply and doubly serrate, glabrous, 2–3 in. long: fls. whitish to deep pink: follicles diverging. July, Aug. B.H. 17:12. Gn. 46, p. 416. Mn. 2, p. 24.—Cult. in many different forms, probably all of garden origin. One of the best is var. **Anthony Waterer,** a very free-flowering, compact shrub with bright crimson fls. in rather dense corymbs. Gn. 45:945. G.C. III. 14:365. A similar form is **S. Lemòinei,** Zabel (*S. Bumálda*, var. *rubérrima*, Hort.), hybrid of *S. Bumalda* and *S. bullàta*, a low, compact shrub, with somewhat bullate lvs. and pink fls.

31. **albiflóra,** Miq. (*S. Japónica álba,* Regel. *S. leucántha,* Lange). Fig. 2367. Low shrub, 1½ ft. high, with stiff, upright branches: lvs. lanceolate, coarsely or sometimes doubly serrate, glabrous, 1–2 in. long: fls. white, in dense corymbs, one large terminal and many smaller ones below, forming a kind of raceme; disk prominent; sepals reflexed in fr.: follicles upright, not or little diverging. July, Aug. Japan.

32. **supèrba,** Zabel (*S. albiflòra × corymbòsa*). Low shrub, with striped dark brown branches: lvs. elliptic-oblong to oblong, acute at both ends, simply or doubly serrate, almost glabrous, 1–3 in. long: fls. rather large, pink or almost whitish; disk prominent; petals orbicular or broadly obovate. June, July. Of garden origin.



2367. Spiræa albiflora (× ⅛).

33. **corymbòsa,** Raf. (*S. cratægifòlia,* Link.). Low shrub, with usually little-branched stems, rarely to 3 ft. high: branches purplish brown: lvs. broadly oval to ovate, acutish, coarsely and often doubly serrate, especially above the middle, pale bluish green beneath and glabrous, 1½–3 in. long: fls. white, rather small, in somewhat convex usually pubescent corymbs, 1½–3 in. across; petals oval: follicles and styles upright. May, June. N. J. to Ga. L.B.C. 7:671.

34. **lùcida,** Dougl. Closely allied to the former: branches yellowish brown or brown: lvs. more incisely serrate, oval or obovate: corymb glabrous, usually looser and more flat, broader. June, July. Dakota to Brit. Col. and Oregon. The allied **S. Virginiàna,** Britt., is more branched and higher: lvs. oblong to oblanceolate, dentate above the middle or almost entire: inflorescence glabrous. Va. to N. C. B.B. 2:197.

35. **betulifòlia,** Pall. Low, much-branched shrub: lvs. oval to obovate or obovate-oblong, usually cuneate at base and very short-petioled, serrate or crenately serrate, obtuse, glabrous or slightly pubescent on the veins beneath, ¾–1½ in. long: corymb usually glabrous, 1–2 in. across. June, July. Siberia to Manchuria, Kamschatka and Japan.—The two preceding and the following species are all closely allied and considered by some botanists as varieties of *S. betulifolia.*

36. **densiflòra,** Nutt. (*S. betulifòlia,* var. *ròsea,* Gray. *S. ròsea,* Koehne. *S. arbúscula,* Greene). Low, much-branched shrub: lvs. very short-petioled, oval to ovate, obtuse, crenately serrate, ¾–1½ in. long: fls. bright pink, in dense corymbs 1–2 in. across. June–Aug. Ore. to Calif., southern Manchuria. G.F. 10:413.

SECTION 5. SPIRARIA (Species Nos. 37–49).

A. *Inflorescence a broad panicle, about as broad as high.* (*Hybrids of species of this and the preceding section.*)
  B. *Panicles rather small, on lateral branchlets at the end of last year's branches* ....37. **Fontenaysii**
  BB. *Panicles large, terminal on long, upright branches.*
    C. *Lvs. glabrous or nearly so.*
      D. *Apex of lvs. acute*..........38. **conspicua**
      DD. *Apex of lvs. obtuse or acutish.*
        E. *Shape of lvs. broadly ovate or obovate*.......39. **notha**
        EE. *Shape of lvs. oblong or oval-oblong* ....40. **pyramidata**
    CC. *Lvs. pubescent or tomentose beneath.*
      D. *Base of lvs. acute* ....41. **Sanssouciana**
      DD. *Base of lvs. rounded*......42. **Nobleana**
AA. *Panicles elongated, longer than broad.* (*Spiraria proper.*)
  B. *Foliage glabrous or nearly so.*
    C. *Lvs. sharply serrate, except at the very base.*
      D. *Panicles tomentulose.*
        E. *Fls. light pink*..........43. **salicifolia**
        EE. *Fls. white*...............44. **alba**
      DD. *Panicles glabrous*.........45. **latifolia**
    CC. *Lvs. coarsely serrate above the middle: fls. pink*.......46. **Menziesii**
  BB. *Foliage pubescent or tomentose beneath.*
    C. *Follicles glabrous: lvs. grayish or whitish tomentose beneath.*
      D. *Lvs. acute at both ends*....47. **Billardii**
      DD. *Lvs. rounded or nearly so at both ends*.............48. **Douglasi**
    CC. *Follicles pubescent: lvs. usually light tawny beneath.*49. **tomentosa**

37. **Fontenàysii,** Billard (*S. Fontanaysiénsis,* Dipp. *S. canéscens × salicifòlia*). Shrub, 6 ft. high, with slender, upright branches: lvs. oval or oblong-oval, rounded at both ends, crenately serrate above the middle, pale bluish green beneath, almost glabrous, 1–2 in. long: fls. white or pink, in 1½–3-in. long panicles; petals orbicular, about as long as stamens; sepals spreading in fruit. June, July. Of garden origin.—Not quite hardy north. Var. **álba,** Zabel, is the white-fld., var. **ròsea,** Zabel, the pink-fld. form. **S. pruinòsa,** Hort. (*S. brachybótrys,* Lange. *S. luxuriòsa,* Hort. *S. canéscens × Doúglasi*), is a similar form, but the lvs. are tomentose beneath and the fls. pink.

38. **conspícua,** Zabel (*S. albiflòra × álba*). Upright shrub, 3 ft. high, with dark brown puberulous branches: lvs. elliptic-oblong, acute at both ends, simply or doubly serrate, almost glabrous, 1½–2½ in. long: fls. pinkish white, in broad finely pubescent panicles; petals shorter than stamens. July–Sept.—Handsome form. A similar hybrid is **S. syringæflòra,** Lem. (*L. albiflòra × salicifòlia*), with oblong-lanceolate or lanceolate lvs. serrate above the middle and pink fls. Closely allied is also **S. semperflòrens,** Zabel (*S. Japónica × salicifòlia. S. Japónica* or *Fórtunei,* var. *paniculàta,* Hort.). Higher than the former: lvs. oblong-lanceolate, usually doubly serrate: fls. pink. R.H. 1860, p. 496, 497. Gn. 45, p. 48.

39. **nòtha,** Zabel (*S. corymbòsa* × *latifòlia*). Shrub. 3 ft. high, with brown glabrous branches: lvs. broadly ovate to obovate, short-petioled, coarsely and doubly serrate, almost glabrous, 1–2 in. long: fls. white to pinkish white, in broad, glabrous panicles; stamens almost twice as long as the orbicular petals. July, Aug. —Of garden origin.

40. **pyramidàta,** Greene (*S. lùcida* × *Ménziesi*). Upright shrub, 3 ft. high: lvs. oval-oblong to oblong, acutish or obtuse, usually doubly serrate above the middle, glabrous or nearly so, 1½–3 in. long: panicles 1½–3½ in. long, rather dense, puberulous: fls. pinkish or almost white. July. Found wild in Ore. and Washington.—Worthy of cultivation, but not yet introduced.

41. **Sanssouciàna,** C. Koch (*S. Doúglasi* × *Japònica*. *S. Regeliàna*, Hort.). Shrub, 4 ft. high, with striped, finely tomentose branches: lvs. oblong-lanceolate, sharply and usually doubly serrate, grayish tomentose beneath, 2–3½ in. long: fls. pink, in broad corymb-like panicles: follicles glabrous, with spreading styles. July, Aug. Of garden origin.—An allied form is **S. intermèdia,** Lemoine (*S. albiflòra* × *Doúglasi*), similar in habit to *S. syringæflora* but with the lvs. tomentose beneath.

42. **Nobleàna,** Hook. (*S. Doúglasi*, var. *Nobleàna*, Wats. *S. Doúglasi* × *densiflòra*). Shrub, 4 ft. high, similar to the former: lvs. oblong or narrowly oblong, usually rounded at the base, acute, sharply serrate above the middle, grayish tomentose beneath, 1–3 in. long: fls. light pink, in dense broadly pyramidal tomentulose panicles, 3–6 in. high; petals half as long as stamens; sepals reflexed in fr.; styles erect. June, July. Natural hybrid, found in Calif. B.M. 5169. I.H. 8:286. —A similar form is **S. pachystachys,** Zabel (*S. corymbòsa* × *Doúglasi*), with broader lvs. and fls. of paler pink.

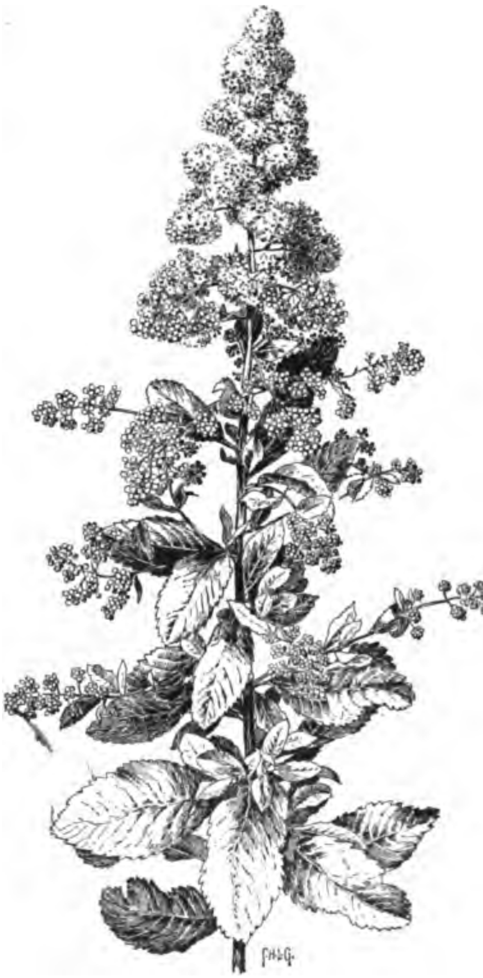
43. **salicifòlia,** Linn. (*S. Sibírica*, Raf. *S. salicifòlia*, var. *cárnea*, Ait.). Upright shrub, 5 ft. high, with terete yellowish brown branches puberulous when young: lvs. oblong-lanceolate to lanceolate, sharply and sometimes doubly serrate with often incurved teeth, 1½–3 in. long: fls. light pink or whitish, in oblong, dense, tomentulose panicles leafy below, the lvs. exceeding the ascending ramifications; stamens twice as long as petals; sepals upright in fr.: follicles ciliate at the inner suture. June, July. S. E. Eu. to Japan and probably Alaska.—Var. **grandiflòra,** Dipp. (*S. grandiflòra*, Lodd.). Lower, with larger, lighter pink fls. L.B.C. 20:1988.

44. **álba,** Dur. (*S. salicifòlia*, var. *paniculàta*, Ait. *S. lanceolàta*, Borkh.). QUEEN OF THE MEADOW. MEADOW SWEET. Fig. 2368. Upright shrub, attaining 6 ft., with reddish brown branches puberulous when young: lvs. narrow, oblong to oblanceolate, acute, usually regularly simply serrate, 1½–2½ in. long: fls. white, in leafy pyramidal tomentulose panicles, the lower spreading ramifications much longer than their supporting lvs.; stamens white, usually as long as petals: follicles quite glabrous. June–Aug. From N. Y. west to the Rocky Mts., south to Ga. and Miss. Also known as *S. salicifolia*.

45. **latifòlia,** Borkh. (*S. salicifòlia*, var. *latifòlia*, Ait. *S. carpinifòlia*, Willd. *S. Canadénsis*, Hort. *S. Bethleheménsis*, Hort.). QUEEN OF THE MEADOW. MEADOW SWEET. Upright branching shrub, from 2–5 ft. high, with bright or dark red-brown glabrous twigs: lvs. broadly oval to obovate or oblong, usually coarsely and often doubly serrate, 1½–3 in. long: fls. white, larger than those of *S. alba*, sometimes lightly blushed and with the stamens and disk more or less pinkish; panicles quite glabrous, broadly pyramidal, with spreading and elongated ramifications; stamens longer than petals. June–Aug. Newfoundland and Canada to N. C. Em. 2:485. B.B. 2:196.—This and the preceding species have been referred by most American botanists to *S. salicifolia*. *S. alba* is chiefly found west, *S. latifolia* east of and in the Alleghanies.

46. **Ménziesi,** Hook. (*S. Doúglasi*, var. *Ménziesi*, Presl.). Upright shrub, 4 ft. high, with brown, at first puberulous branches: lvs. oblong-obovate to oblong, coarsely and unequally serrate above the middle, pale green beneath, 1½–3 in. long: fls. small, pink, in rather narrow, 5–8-in. long panicles; stamens more than twice as long as the roundish petals; sepals reflexed in fruit. June–Aug. Alaska to Oregon.

47. **Billárdii,** Hort. (*S. Doúglasi* × *salicifòlia*). Shrub, 6 ft. high, with brown pubescent branches: lvs. oblong to oblong-lanceolate, acute, sharply and often doubly serrate, except in the lower third, usually grayish tomentose beneath, at least when young, sometimes almost glabrous at length, 2–3 in. long: fls. bright pink, in 5–8-in. long, tomentose or tomentulose panicles, usually rather narrow and dense. July, Aug. Of garden origin.—*S. Lenneàna*, *Bethlehemensis rubra*, *triúmphans*, *exímia*, *Constántia*, *Californica*, Hort., are very similar and probably of the same parentage.

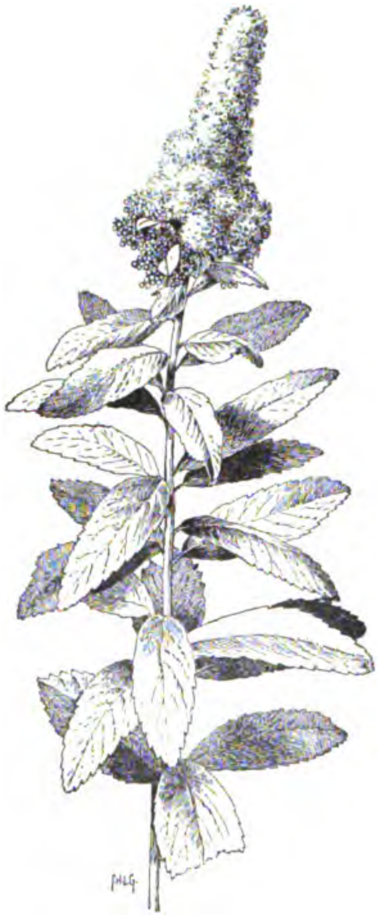


2368. Spiræa alba (× ½).

48. **Doùglasi,** Hook. Fig. 2369. Shrub, 8 ft. high, with reddish brown tomentose branches: lvs. oblong to narrow-oblong, rounded or acutish at both ends, unequally serrate above the middle, densely white-tomentose beneath, 1½–4 in. long: fls. deep pink, in dense, rather narrow or sometimes broad panicles, 4–8 in. long; stamens twice as long as the obovate petals; sepals reflexed in fruit: follicles glabrous. July, Aug. British Columbia to Calif. F.S. 2:66. R.H. 1846:101. P.F.G. 2, p. 85. P.M. 12:195. B.M. 5151. Gn. 23:380.

49. **tomentòsa,** Linn. HARDHACK. STEEPLEBUSH. Shrub, 4 ft. high, with upright, brown, tomentose branches: lvs. ovate to oblong-ovate, acute, unequally and often doubly serrate, densely yellowish or grayish

tomentose beneath, 1-2½ in. long: fls. deep pink or purple, in narrow dense panicles, brownish tomentose and 3-8 in. long; stamens somewhat longer than the obovate petals; sepals reflexed: follicles pubescent, usually diverging. July-Sept. Nova Scotia to Ga., west to Manitoba and Kansas. B.B. 2:196. Em. 2:485.—Var.



2369. Spiræa Douglasi (×⅓).

álba, Hort. With white fls. F.E. 8:833. Gng. 5:149. This species does not spread by suckers like most others of the section Spiraria. All the last named species are valuable as late-blooming shrubs and decorative with their showy panicles of bright or deep pink fls. They appear at their best when planted in masses in the wilder parts of the park in low ground.

S. Amurénsis, Maxim. = Physocarpus Amurensis.—*S. ariæfòlia*, Sm. = Schizonotus discolor.—*S. Arúncus*, Linn. = Aruncus sylvester.—*S. assímilis*, Zabel (S. densiflora × Japonica). Low shrub, with pink fls. in broad corymb-like panicles. Garden hybrid.—*S. astilboìdes*, Hort. = Aruncus astilboides.—*S. Boursièri*, Carr. = Schizonotus discolor, var. dumosus.—*S. brumàlis*, Lange (probably S. expansa × alba). Medium-sized shrub, with oblong, incisely serrate, almost glabrous lvs. and pinkish white fls. in broad and loose corymb-like panicles. Aug.-Oct. Garden hybrid.—*S. Camtschatica*, Pall. = Ulmaria Camtschatica.—*S. capitàta*, Pursh = Physocarpus capitatus.—*S. cinèrea*, Zabel (S. cana × hypericifolia). Medium-sized shrub, with small, oblong, usually entire, pubescent lvs. and white fls. in short-stalked umbels. Garden hybrid.—*S. concínna*, Zabel (S. albiflora × expansa). Medium-sized shrub, with lanceolate, sharply serrate, almost glabrous lvs. and pinkish white fls. in broad corymbs. Garden hybrid.—*S. compácta multiflòra*, Hort. = Astilbe Japonica var.—*S. conférta*, Zabel (S. cana × crenata). Medium-sized shrub, with small, ovate to oblong-lanceolate, 3-nerved, entire or crenate lvs. and white fls. in dense, small, peduncled umbels. Garden hybrid.—*S. Dahùrica*, Maxim., is closely allied to S. alpina, but not yet introduced; S. canescens and Sorbaria sorbifolia are sometimes cult. under this name.—*S. diffórmis*, Zabel (S. alba × corymbosa). Medium-sized shrub, with oval to oblong-lanceolate, serrate, almost glabrous lvs. and white fls. in large corymb-like panicles. Garden hybrid.—*S. díscolor*, Pursh = Schizonotus discolor.—*S. dumòsa*, Nutt. = Schizonotus discolor, var. dumosus.—*S. Filipéndula*, Linn. = Ulmaria Filipendula.—*S. físsa*, Lindl. = Schizonotus discolor, var. fissus.—*S. floribúnda*. A trade name of indiscriminate meaning. S. semperflorens and Sorbaria sorbifolia are sometimes met with under this name.—*S. gemmàta*, Zabel (S. Mongolica, Hort., not Maxim.). Allied to S. alpina: axillary buds much longer than petioles: lvs. small, penninerved, oblong-lanceolate, usually entire: fls. white, in short-stalked, rather few-fld. umbels. Mongolia.—*S. Gieseleriàna*, Zabel (S. cana × chamœdryfolia). Medium-sized shrub, with ovate, sharply serrate lvs. and rather large white fls. in long-stalked umbels. Garden hybrid.—*S. gigantèa*, Hort. = Ulmaria Camtschatica.—*S. grácilis*, Maxim. (S. vacciniifolia, Lodd., not Don). Low shrub, allied to S. canescens, with slender, arching branches: lvs. small, ovate, obtuse, entire or crenate above the middle, quite glabrous: fls. white, in hemispherical loose corymbs. Himal. L.B.C. 15:1403.—*S. grandiflòra*, Sweet = Sorbaria grandiflora.—*S. grandiflòra*, Hook. = Exochorda grandiflora.—*S. Hacquétii*, Fenzl. & Koch. Closely allied to S. decumbens, but grayish pubescent and with the sepals upright or spreading in fr. N. Italy, Tyrol.—*S. Hoòkeri*, garden name, applied to S. nudiflora, bella, expansa, tristis and others, and also to Exochorda grandiflora.—*S. Húmboldtii*, Hort. = Aruncus sylvester.—*S. Japónica*, Hort., not Linn. f. = Astilbe Japonica.—*S. infléxa*, C. Koch (S. crenata × mollis). Medium-sized shrub, with slender arching branches: lvs. elliptic-oblong, entire, sparingly pubescent beneath: fls. white, rather large, in many-fld. stalked umbels. Garden hybrid.—*S. Kamaonénsis spicàta*, Hort., is a form of S. semperflorens.—*S. Kamschática*, Auth. = Ulmaria Camtschatica.—*S. lancifòlia*, Hoffmsgg. supposed to be S. Hacquetii.—*S. laxiflòra*, Lindl. = S. vacciniifolia.—*S. Lindleyàna*, Wall. = Sorbaria Lindleyana.—*S. lobàta*, Gronov. = Ulmaria rubra.—*S. micropétala*, Zabel (S. hypericifolia × media). Medium-sized shrub, with grayish green, oblong-obovate lvs., entire or serrate at the apex, 3- or penninerved: fls. white or greenish white, in umbels on leafy or naked stalks. Garden hybrid.—*S. Millefòlium*, Torr. = Sorbaria Millefolium.—*S. móllis*, C. Koch (S. cana × media). Similar to S. media: lvs. smaller, usually entire, pubescent: fls. smaller, umbels pubescent. Garden origin.—*S. Mongólica*, Maxim., is closely allied to S. crenata, but not yet introduced; the S. Mongolica of gardens is S. gemmata.—*S. monógyna*, Torr. & Gray = Physocarpus monogynus.—*S. Nepalénsis*, a garden name applied to several species, as S. micropetala, canescens, salicifolia, etc.—*S. nívea*, Zabel (S. canescens × expansa). Similar to S. canescens in habit, corymbs larger and looser: lvs. coarsely doubly serrate, pubescent, 1-2 in. long: fls. white or pinkish white. Garden hybrid.—*S. nudiflòra*, Zabel (S. bella × ulmifolia). Medium-sized shrub, with ovate, doubly serrate, almost glabrous lvs. and pinkish white fls. in hemispherical corymbs. Handsome, almost hardy shrub. Garden hybrid.—*S. opulifòlia*, Linn. = Physocarpus opulifolia.—*S. oxyòdon*, Zabel (S. chamædryfolia × media). Similar to S. media, but branches angular: lvs. narrower, follicles with the styles terminal and spreading. Garden hybrid.—*S. Pállasii*, G. Don = Sorbaria grandiflora.—*S. palmàta*, Pall. = Ulmaria palmata.—*S. palmata*, Thunb. = Ulmaria purpurea.—*S. palmàta*, Linn. = Ulmaria rubra.—*S. parvifòlia*, Bertol. = S. gracilis.—*S. revirèscens*, Zabel (S. expansa × Japonica). Medium-sized shrub, with oblong, coarsely serrate lvs., pubescent on the veins beneath: fls. light to deep pink, in large corymbs; blooming in summer and usually again in fall. Garden hybrid.—*S. ribifòlia*, Nutt. = Physocarpus capitatus.—*S. rùbra*, Zabel (S. ruberrima, Dipp. S. Douglasi × expansa). Upright medium-sized shrub, with oblong-lanceolate, coarsely serrate lvs. tomentose beneath, and deep pink fls. in ovate panicles. Garden hybrid.—*S. Schinabéckii*, Zabel (S. chamædryfolia × trilobata). Medium-sized shrub, with arching branches: lvs. ovate to oblong-ovate, doubly serrate, glabrous: fls. white, rather large, in peduncled umbels: petals longer than stamens. Handsome shrub, similar to S. Van Houttei. Garden hybrid.—*S. sorbifòlia*, Linn. = Sorbaria sorbifolia.—*S. Tobólskia*, Lodd. = Sorbaria sorbifolia.—*S. trifoliàta*, Linn. = Gillenia trifoliata.—*S. trístis*, Zabel. Hybrid of unknown origin, similar to S. expansa, but corymbs and the whitish pink fls. smaller; sepals upright in fr.—*S. Ulmària*, Linn. = Ulmaria pentapetala.—*S. vacciniifòlia*, D. Don (S. laxiflora, Lindl.). Shrub, to 2 ft., with arching branches: lvs. long-petioled, ovate, crenately dentate, almost glabrous, ¾-1½ in. long: fls. whitish, in tomentose corymbs, 1-3 in. across June, July. Himal. P.F.G. 2, p. 98. F.S. 7, p. 190.—*S. vacciniifòlia*, Lodd. = S. gracilis.—*S. vacciniifòlia*, Hort. = S. canescens, brumalis, etc.—*S. venùsta*, Hort. = Ulmaria rubra, var. venusta.—*S. venùstula*, Kunth & Bouché = S. vacciniifolia.

ALFRED REHDER.

SPIRAL FLAG. See *Costus*.

SPIRÁNTHES (name Greek; referring to the twisted spikes). *Orchidàceæ*. LADIES' TRESSES. A genus including about 40 species dispersed throughout the temperate zone and extending south to Chile, all terrestrial herbs, few of which have any horticultural value. Some of the hardy species are advertised by dealers in native plants and by collectors. Erect herbs with fleshy or tuberous roots: lvs. mostly at the base or on the lower part of the stem: raceme terminal, twisted: fls. spurless, small or medium-sized; sepals free or more or less united at the top, or united with the petals into a helmet; labellum sessile or clawed, concave, embracing the column and spreading into a crisped, sometimes lobed or toothed blade: pollinia 2, powdery.

A. *Color of fls. scarlet.*

coloràta, N. E. Br. (*S. colòrans*, Hemsl.). Lvs. elliptic to elliptic-oblong, undulate, acute, 5–6 in. long: stem 2 ft. high: spike 3 in. long: fls. and longer bracts scarlet. April. Mexico. B.M. 1374 (as *Neottia speciosa*).

AA. *Color of fls. white or whitish.*

B. *Fls. in 3 rows: lvs. persistent at the flowering time.*

cérnua, Rich. NODDING LADIES' TRESSES. Lvs. mostly basal, linear or linear-oblanceolate: stem 6–25 in. high, usually pubescent above, with 2–6 acuminate bracts: fls. white or yellowish, fragrant, nodding or spreading, in a spike 4–5 in. long; lateral sepals free, the upper arching and connivent with the petals; labellum oblong, rounded at the apex, crisp. Aug.–Oct. Nova Scotia to Minn. and south to Fla. B.M. 1568 (as *Neottia cernua*); 5277. B.R. 10:823. B.B. 1:471. A.G. 13:467. V. 11:13.

Romanzoffiàna, Cham. & Schlecht. Lvs. linear to linear-oblanceolate, 3–8 in. long: stem 6–15 in. high, leafy below: spike 2–4 in. long: fls. white or greenish, ringent; sepals and petals broad at base, connivent into a hood; labellum oblong, broad at the base, contracted below and dilated at the apex, crisp. July, Aug. N. Amer. B.B. 1:470. G.C. II. 16:465; 26:400.

latifòlia, Torr. Stem 4–10 in. high, glabrous or pubescent, bearing 4–5 lanceolate or oblanceolate lvs. near the base: fls. small; sepals and petals white, lateral sepals free, narrowly lanceolate, the upper one somewhat united with the petals; labellum quadrate-oblong, yellowish above, not contracted in the middle, wavy-crisp, obtuse or truncate. June–Aug. New Brunswick to Minn. and Va. B.B. 1:470.

BB. *Fls. alternate, appearing in a single spiral row.*

C. *Lvs. present at the flowering time.*

prǽcox, Watson (*S. graminea*, var. *Wálteri*, Gray). Lvs. linear, 4–12 in. long, grass-like: stem 10–30 in. high, glandular-pubescent above, leafy: spike 2–8 in. long: fls. white or yellowish, spreading; lateral sepals free, the upper one connivent with the petal, labellum oblong, contracted above and dilated toward the apex. July, Aug. N. Y. to Fla. and La. B.B. 1:471.

CC. *Lvs. mostly withered at the flowering time.*

simplex, Gray. Root a solitary oblong tuber: lvs. basal, ovate to oblong, short, absent at the flowering time: stem very slender, 5–9 in. high: spike about 1 in. long: fls. white: labellum obovate-oblong, eroded and crisp. Aug., Sept. Mass. to Md. B.B. 1:472. A.G. 13:466.

grácilis, Beck. Roots clustered: lvs. basal, obovate to ovate-lanceolate, petioled, mostly dying before the flowering time: stem 8–18 in. high, bearing a slender, many-fld., 1-sided or twisted spike: fls. white, fragrant; sepals longer than the labellum, the lateral ones free; labellum oblong, dilated in front, crenulate or wavy-crisp, thick and green in the middle. Aug.–Oct. Eastern N. Amer. B.B. 1:472. A.G. 13:466.

HEINRICH HASSELBRING.

SPIRODÈLA. Consult *Lemna*.

SPLEENWORT. *Asplenium*.

SPÓNDIAS. See page 1864.

SPONGE TREE. *Acacia Farnesiana*. **S., Vegetable.** *Luffa*.

SPRÀGUEA (after Isaac Sprague, of Cambridge, Mass., botanical artist, collaborator of Asa Gray). *Portulacàceæ*. Probably only a single species, a biennial herb 2–12 in. high, with mostly radical, spatulate, fleshy leaves and ephemeral flowers in dense, scorpioid spikes, umbellately clustered on scape-like peduncles: sepals 2; petals 4; stamens 3: capsule 2-valved; seeds 8–10, black, shiny.

umbellàta, Torr. May be treated as an annual. Fls. white, tinged with rose, in late summer. Sierra Nevada, at 3,000–10,000 ft. altitude, from the Yosemite valley to the British boundary, usually in sandy dry soils. B.M. 5143.—Var. **caudicífera,** Gray, is a subalpine form in which the caudex-like branches extend for a year or more (the leaves below dying away) and are at length terminated by scapes an inch or so in length. Desirable for rockwork and edgings. F. W. BARCLAY.

SPRAYING (see *Pomology*), the art of protecting cultivated plants from insect enemies and vegetable parasites by covering them with a spray which shall have a toxic or physically injurious effect upon the animal or vegetable organism.

Historical Sketch.—The history of spraying is interesting. The story of its progress in America differs in details from the history of its development in Europe. The main features in each country are quite similar. In both places insect enemies made the first draft on the ingenuity of man in devising methods by which to hold them in check. Vegetable parasites were studied afterwards. It is a curious fact that, in the case of both insects and fungi, in America, some of the most injurious forms came from Europe and were the means of directing attention to wholesale methods of destroying them. Some of these enemies, comparatively harmless in 'their native home, like the currant worm and codlin-moth, have done more to forward spraying methods in the United States than anything else.

The first insecticides used in America, as well as in Europe, were not of a poisonous nature. They were substances which had an injurious effect on the body of the insect. These were of two kinds mainly: infusions which were astringent, and caustic substances which burned the tissues. Tobacco water and alkaline washes have been used for many years. One of the first poisons to be used was white hellebore. The employment of arsenical poisons may be said to belong to America, and even at the present time has small place in the economy of fruit-growing in Europe. The widespread use of arsenical poisons is largely due to the influence of the incursion of the potato bug. We have no reliable records which give us the exact date of the first use of Paris green. It probably occurred about 1865 or 1866. However, towards 1870 Paris green was used quite generally throughout the western region where the potato bug first appeared. At this time it was applied almost exclusively in the dry form diluted with gypsum or flour. From potato to cotton, tobacco and finally to fruit trees, is the development of this poison for destroying leaf-eating insects. So far as records are available, it appears that fruit trees were first sprayed with Paris green between 1873 and 1875. Among pioneer sprayers, we should mention the names of Dr. C. V. Riley, United States entomologist;

2370. Apple cluster ready for the spray.
The blossoms have not yet opened.

LeBarron, state entomologist of Illinois; William Saunders, London, Ontario, Can.; J. S. Woodward, Lockport, N. Y.; T. G. Yeomans & Sons, Walworth, N. Y.; Professor A. J. Cook, Agricultural College, Mich.

Following Paris green came London purple, and then white arsenic. Since that time many different forms of arsenical poisons have been compounded, offered to the public and frequently used. London purple has now been largely dropped by fruit-growers, owing to its variable quality. White arsenic, used in combination with soda and with lime, forms at the present time reliable and widely used insecticides.

2371. Splint broom for applying spray. An early device.

While sucking insects were instrumental in bringing about the invention of many formulæ, it has only been within the last twenty-five years that an effective method has been devised for their treatment. Although kerosene has been recommended and used to some extent for thirty-five or more years, it was not until Cook recommended kerosene in the form of a soap and water emulsion that a desirable, easily prepared oily insecticide was found. About the same time, Dr. Riley, with Mr. Hubbard, of the Department of Agriculture at Washington, recommended the use of what is now known as the Riley-Hubbard formula.

The potato bug invasion and the discovery of the efficacy of Paris green in destroying leaf-eating insects did a great deal to stimulate spraying, but due credit should be given plant pathologists for tracing the life-histories of many fungi destructive to cultivated plants.

Fungicides.—Early in the eighties diseases of grape-vines threatened the extinction of French vineyards. The situation engaged the attention of French investigators. Notable among them were Professor A. Millardet and his co-workers of the Academy of Science, Bordeaux, France. He, with others, discovered partly by accident and partly by experiment that solutions of copper prevented the development of downy mildew. After much experimentation, "bouillie Bordellaise" was found to be effective in preventing the growth of downy mildew and other plant parasites infesting the grape in that region. The announcement was definitely made in 1885. The following year the European formula for Bordeaux mixture was published in several places in the United States, and immediately there commenced an unparalleled period of activity in economic vegetable pathology. The establishment of the U. S. experiment stations gave added impetus to the movement. The rapidity of the spread of spraying knowledge among fruit-growers is remarkable. Ten years ago it was an unknown art by the rank and file. To-day agricultural clubs and granges purchase their spraying materials by the car-load direct from the manufacturer. The American farmer leads his fellow-workers in all parts of the world in the practice of spraying. Although Bordeaux mixture was discovered in Europe, its application has been made practicable by American inventions.

2372. A bucket pump.

The Principles of Spraying.—A spray may be effective (*a*) by hitting the enemy, (*b*) by placing poison before the depredator, and (*c*) by protecting the plant with a covering unfavorable to the growth of the pest. The cautious farmer insures his crop against injury by insect or vegetable parasite by spraying. The fruit-grower asks, "Do I need to spray this year? My trees are not blossoming." Certainly, we answer, spray to protect the foliage from possible injury by insect or fungous disease. Healthy foliage is essential to the production of health and vigor and fruit-buds. Spray this year for next year's crop.

Insecticides kill by contact or by means of a poisonous principle; their efficiency depends largely on the time and thoroughness of the application. If applied too soon they may be dissipated before the insects appear; if applied late the injury is only partly prevented, because insects feed less voraciously and are harder to kill as they approach maturity in the larval stage. With the vegetable parasite the case is not essentially different. The tree is covered with a thin coating which destroys spores of fungi resting there and prevents other spores from germinating. Fig. 2370 shows the stage of development of fruit-bud calling for Bordeaux mixture and Paris green. The keynote to success is thoroughness. Hasty sprinklings are worse than useless; they discourage and disappoint the beginner. Full protection is not afforded unless each leaf, twig and branch has been covered. Time is the next most important factor bearing on success. The early spray is most effective. This applies particularly to the treatment of fungous diseases. Spray before the buds open. Get ahead of the enemy.

2373. Knapsack pump.

Spraying Machinery.—Bordeaux mixture was first applied with a broom (Fig. 2371); now there are not a few steam sprayers in use. Poison distributors were first made in America for the protection of cotton, potato and tobacco. There are five general types of pumps: (1) The hand portable pump, often attached to a pail or other small reservoir, suitable for limited garden areas. (2) The knapsack pump is carried on a man's back and operated by the carrier. The tank is made of copper, holds five gallons and is fitted with a neat pump which may be operated with one hand while the nozzle is directed with the other. Excellent for spraying small vineyards and vegetable gardens. (3) A barrel pump: a strong force pump fitted to a kerosene barrel or larger tank, suitable for spraying orchard areas up to 15 acres in extent; may be mounted on a cart, wagon, or stoneboat, depending on the character of the ground and size of trees. (4) A Gear-sprayer; being a tank provided with a pump and mounted on wheels. The pump is operated by power borrowed from the wheels as they revolve, and transferred by means of chain and sprockets. Suitable for vineyards and low-growing plants, which may be satisfactorily covered by the spray as the machine moves along. For this reason it is not adapted to orchard work. (5) The power sprayer; power being furnished by steam, gasoline, or compressed air. When the trees are large and the orchard over fifteen acres in extent, a power sprayer will usually pay. Some of these various types of machinery are shown in Figs. 2372–2379.

The essentials of a good pump are (1) durability: secured by having brass working parts (copper compounds corrode iron); (2) strength: obtained by a good-sized cylinder, substantial valves, wall and piston; (3) easily operated: found in a pump with long handle, large air-chamber and smoothly finished working parts; (4) compactness: secured by placing the cylinder so that it is inclosed by the tank, preventing top-heaviness and facilitating the movement of the pump in the orchard. A barrel or tank pump should be strong enough to feed two leads of hose and throw a good spray from four nozzles. Nearly all spray mixtures require occasional stirrings to prevent settling and insure uniformity. An agitator is a necessary part of the pump's equipment.

Special Devices.—One of these is for the making and applying mechanically emulsified definite proportions of water and kerosene. The liquids are placed in two separate vessels, each of which is supplied with a pump. The apparatus has a gauge attached which enables the operator to set it for 5, 10, 15 or 20 per cent of kerosene, as the case may be. As the kerosene and water are forced through the pump and nozzles they are thoroughly emulsified. This type of pump is not yet perfected, but marks a distinct step in advance and fills an important place in the treatment of scale and other sucking insects. For special devices, consult experiment station bulletins.

Nozzles.—The nozzles of twelve or fifteen years ago were crude affairs when compared with those now in use. They usually discharged the liquid in a solid stream, or a coarse spray formed by passing through a sieve-like diaphragm. These are now obsolete. Several types of nozzles are on the market. They all aim at economy and efficiency. A nozzle producing a fine misty spray (much to be desired) uses a minimum amount of liquid, but the spray cannot be projected effectively more than six or seven feet from the nozzle. A coarse spray can be thrown much farther. but drenches rather than sprays the tree and naturally uses a large quantity of liquid. For small trees and bush fruits the Vermorel (Fig. 2380), or fine spray type, is best, while for old orchards and park work, nozzles of the McGowan and Bordeaux style (Fig. 2381) are most satisfactory. It is now a common practice to attach two (or even more) nozzles to one discharge (Figs. 2380, 2381).

2374. A garden barrel pump.

2375. An orchard barrel pump.

2376. Vineyard power sprayer.

FORMULAS.

(The commoner mixtures excluding resin washes.)

PARIS GREEN.

Paris green	1 pound
Water	100–300 gallons

If this mixture is to be used upon fruit trees, 1 pound of quicklime should be added. Repeated applications will injure foliage of most trees unless the lime is used. Paris green and Bordeaux mixture can be applied together with perfect safety. Use at the rate of 4 to 8 ounces of the arsenite to 50 gallons of the mixture. The action of neither is weakened, and the Paris green loses its caustic properties. For insects that chew.

LONDON PURPLE.—This is used in the same proportion as Paris green, but as it is more caustic it should be applied with two or three times its weight of lime, or with the Bordeaux mixture. The composition of London purple is variable, and unless good reasons exist for supposing that it contains as much arsenic as Paris green, use the latter poison. Unsafe on peach or plum trees unless considerable lime is added. For insects that chew.

ARSENITES OF LIME AND SODA.—These are cheap, the amount of arsenic is under perfect control and it does not burn the foliage. For chewing insects.

Arsenite of lime is made by boiling 1 pound white arsenic in 2 to 4 quarts water until it is dissolved, then use this arsenic solution to slake 2 pounds good lime, adding water if necessary to slake it; when slaked, add water enough to make 2 gallons of this stock mixture. Also prepared by boiling together, for 30 or 40 minutes, 1 pound white arsenic and 3 pounds lime putty by weight in 2 gallons of water; when dissolved it must be measured so that the arsenic may be applied with accuracy. Keep in a tight vessel and use as desired. Thoroughly stir before using. For most insects one quart to 40 gallons will be sufficient. Arsenite of lime is insoluble in water and will not injure the foliage of any orchard fruit at this strength. This insecticide is growing in popularity. Some green dye stuff may be mixed with it to prevent the ever-present danger of mistaking it for some other material.

Arsenite of soda: The arsenic (1 lb.) may also be boiled with 4 pounds of sal-soda crystals in 2 gallons water until dissolved, and this solution used in the same manner (with lime). The arsenite of lime is cheaper, and either can be used with Bordeaux mixture the same as Paris green. When used with water, however, it will be safer to put in some freshly slaked lime. More expensive than arsenite of lime, but thought by some orchardists to be more effective.

OTHER ARSENITES.—*Green arsenoid* and *Paragrene* are more bulky and finer than Paris green, and when of good quality they are just as effectual and require less agitation. *Arsenate of lead* can be applied in large quantities without injury to the foliage, hence it is very useful against beetles and similar insects that are hard to poison: it also adheres to the foliage a long time.

NORMAL OR 1.6 PER CENT BORDEAUX MIXTURE.

Copper sulfate (blue vitriol)	6 pounds
Quicklime (good stone lime)	4 pounds
Water	50 gallons

For peaches and Japanese plums, an extra amount of lime should be added, and more water (60 or 70 gallons) should be used.

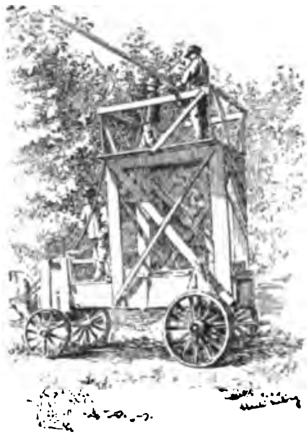
Six pounds of sulfate of copper dissolved in 50 gallons of water, when applied at the proper time, will prevent the growth of fungi. However, if applied in this form, the solution will burn the foliage. Four pounds of quicklime in 6 pounds of copper will neutralize the caustic action. When sulfate of copper and lime are added in this proportion, the compound is Bordeaux mixture. Potatoes demand full strength. Diluted Bordeaux mixture is effective against certain mildews and fruit diseases.

Weighing of copper and lime at time of mixing is very inconvenient. Bordeaux mixture is best when used within a few hours after being mixed. Therefore a stock mixture of Bordeaux is impracticable. It is, however, practicable to have stock preparations of sulfate of copper and of lime ready for mixing when required.

The lime should be "slaked" in a barrel or box with sufficient water to prevent burning, but not enough to smother. Important. When slaked must always be covered with water to exclude the air. In this manner lime can be kept all summer unimpaired.

One gallon of water will hold in solution, all summer, 3 pounds of copper sulfate. To accomplish this the sulfate should be suspended at the surface of the water in a bag. The water most loaded with copper will sink to the bottom, and the water least loaded will rise to the surface. If 50 pounds of sulfate are suspended in 25 gallons of water on an evening, each gallon of water will, when stirred the next morning, hold two pounds of sulfate.

Three gallons of this solution put in the spray barrel equal six pounds of copper. Now fill the spray barrel half full of water before adding any lime. This is important, for if the lime is added to so strong a solution of sulfate of copper, a curdling process will follow. Stir the water in the lime barrel so as to make a dilute milk of lime, but never allow it to be dense enough to be of a creamy thickness. If in the latter condition, lumps of lime will clog the spray nozzle. Continue to add to the mixture this milk of lime so long as drops of ferrocyanide of potassium (yellow prussiate of potash) continue to change from yellow to a brown color. When no change of color is shown, add another pail of milk of lime to make the necessary amount of lime a sure thing. A small excess of lime does no harm. The barrel can now be filled with water, and the Bordeaux mixture is ready for use.



2377. Square tower, giving more working space for the nozzle-men than the conical form.

The preparation of ferrocyanide of potassium for this test may be explained. As bought at the drug store, it is a yellow crystal and is easily soluble in water. Ten cents' worth will do for a season's spraying of an average orchard. It should be a full saturation; that is, use only enough water to dissolve all the crystals. The cork should be notched or a quill inserted so that the contents will come out in drops. A drop will give as reliable a test as a spoonful. The bottle should be marked "Poison." Dip out a little of the Bordeaux mixture in a cup or saucer, and drop the ferrocyanide on it. So long as the drops turn yellow or brown on striking the mixture, the mixture has not received enough lime.

AMMONIACAL COPPER CARBONATE.

Copper carbonate	5 ounces
Ammonia (26° Beaumé)	3 pints
Water	45 gallons

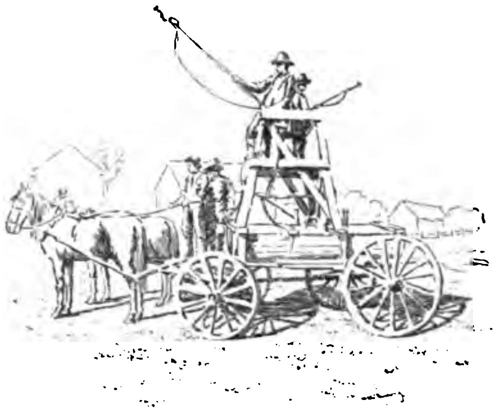
Make a paste of the copper carbonate with a little water. Dilute the ammonia with 7 or 8 volumes of water. Add the paste to the diluted ammonia and stir until dissolved. Add enough water to make 45 gallons. Allow it to settle and use only the clear blue liquid. This mixture loses strength on standing. For fungous diseases.

2379. Power sprayer, using steam.

COPPER SULFATE SOLUTION.

Copper sulfate	1 pound
Water	15-25 gallons

Dissolve the copper sulfate in the water, when it is ready for use. This should never be applied to foliage but must be used before the buds break. For peaches and nectarines, use 25 gallons of water. For fungous diseases, but now largely supplanted by the Bordeaux mixture. A much weaker solution has been recommended for trees in leaf.



2378. Orchard pump with conical tower rig.

IRON SULFATE AND SULFURIC ACID SOLUTION.

Water (hot)	100 parts
Iron sulfate, as much as the water will dissolve.	
Sulfuric acid (commercial)	1 part

The solution should be prepared before using. Add the acid to the crystals, and then pour on the water. Sometimes recommended for grape anthracnose, the dormant vines being treated by means of sponges or brushes, but it should be applied with caution.

POTASSIUM SULFIDE SOLUTION.

Potassium sulfide (liver of sulfur)	½-1 ounce
Water	1 gallon.

This preparation loses its strength upon standing, and should therefore be made immediately before using. Particularly valuable for surface mildews.

HELLEBORE.

Fresh white hellebore	1 ounce
Water	3 gallons

Apply when thoroughly mixed. This poison is not so energetic as the arsenites, and may be used a short time before the sprayed parts mature. For insects that chew.

KEROSENE EMULSION.

Hard soap	½ pound
Boiling soft water	1 gallon
Kerosene	2 gallons

Dissolve the soap in the water, add the kerosene, and churn with a pump for 5 to 10 minutes. Dilute 4 to 25 times before applying. Use strong emulsion for all scale insects. For such insects as plant lice, mealy bugs, red spider, thrips, weaker preparations will prove effective. Cabbage worms, currant worms and all insects which have soft bodies, can also be successfully treated. It is advisable to make the emulsion shortly before it is used.

Kerosene and water (suggested for San José scale) may be used in all cases where kerosene emulsion is mentioned. Dilute to the strength recommended in each particular case. It must be applied with a pump having a kerosene attachment.

TOBACCO WATER.—This infusion may be prepared by placing tobacco stems in a water-tight vessel, and then covering them with hot water. Allow to stand several hours, dilute the liquor from 3 to 5 times, and apply. For soft-bodied insects.

A special mixture is recommended by Corbett, in Bull. 70, Exp. Sta., W. Va., who reports a trial of Bordeaux mixture, arsenic and kerosene in combination as having proved "gratifying far beyond our most sanguine expectations." "This combination was rendered possible by using the kerosene in the oil tank of a kerowater pump and placing the Bordeaux and arsenic in the barrel in the ordinary manner." For apple aphis, eating insects and fungous diseases.

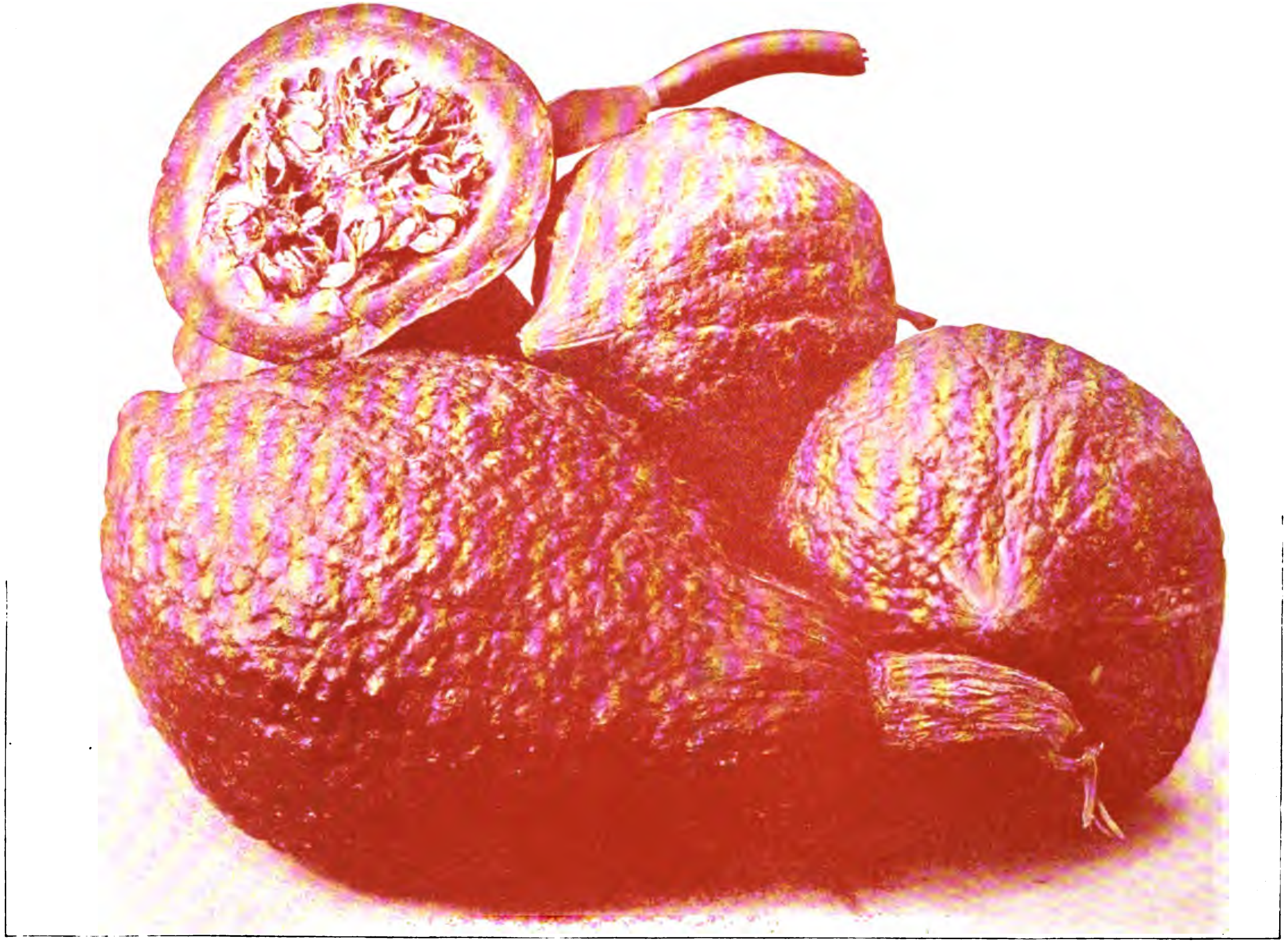


Plate XXXVIII. Hubbard Squash, Cucurbita maxima.

Literature.—To say that the literature of spraying is voluminous would but faintly describe the situation. Hardly an experiment station in the United States has failed to publish two or three times on this subject. Many of them issue annual "spray calenders." The Divisions of Vegetable Pathology and Entomology, Department of Agriculture, Washington, D. C., have added a great number of bulletins to the general collection. One of the first American books, "Fungous Diseases," 1886, was written by F. Lamson Scribner, then of the Division of Veg. Pathology, Washington. Soon after appeared "Insects and Insecticides," and "Fungi and Fungicides," both by Clarence M. Weed. The most notable book which has appeared and the only complete monograph of spraying in existence was published in 1896, the author being E. G. Lodeman, then instructor in horticulture at Cornell University. Of the experiment stations aside from Washington, prominent in reporting field work, New York (Geneva and Cornell), Michigan, Delaware, California, Massachusetts and Vermont should be named, although many others have done well. Spraying, though not an American invention, is now distinctly an American practice by adoption and adaptation.

JOHN CRAIG.

SPREKÈLIA (J. H. von Sprekelsen, of Hamburg, who sent the plants to Linnæus). *Amaryllidàceæ.* JACOBÆAN LILY. A single species from Mexico, a half-hardy bulbous plant with linear, strap-shaped leaves and a hollow cylindrical scape bearing one large showy flower. Perianth strongly declined, tube none; segments nearly equal, the posterior ascending, the inferior concave and enclosing the stamens and ovary: bracts only one, spathe-like: stamens attached at the base of the perianth-segments, and somewhat shorter than the segment by which they are enclosed, having a few small scales at the base of the filaments: ovary 3-loculed: style long, slender: seeds compressed ovate or orbicular, black.

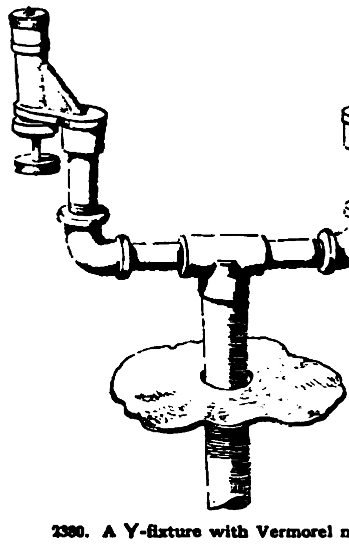
formosíssima, Herb. (*Amarýllis formosissima*, Linn.). Fls. red. B.M. 47.—Var. **glaùca** has somewhat paler and smaller fls. and glaucous lvs. B.R. 27:16. For culture, see *Amaryllis.*

F. W. BARCLAY.

SPRING BEAUTY. *Claytonia.*

SPROUTING LEAF. Catalogue name for *Bryophyllum.*

SPRUCE. See *Picea.* **Norway S.** is *P. excelsa.* **Sitka S.** is *P. Sitchensis.* **Tideland S.** is *P. Sitchensis.*



2380. A Y-fixture with Vermorel nozzles.

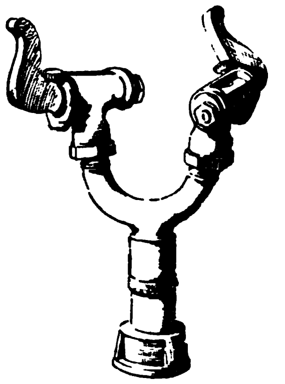
A leather shield is shown, for protecting the hands from the drip.

SPURGE. Consult *Euphorbia.*

SPURGE, MOUNTAIN. *Pachysandra procumbens.*

SPURGE NETTLE. *Jatropha.*

SPURRY (*Spergula arvensis*, which see) has long been grown in Germany, France, Holland and Belgium, where its value as a soil renovator and as a forage crop was early recognized. It is an annual, and when sown in the spring matures seed in from ten to twelve weeks from time of sowing. This plant possesses special value as a renovator for sandy soils. It has long been used by the farmers of Holland to hold in place the shifting sands along the seashore. So well adapted is it to sand that it has been termed "the clover of sandy lands." It is not recommended for the American farmer except where the soil is so poor that other plants fail. In such circumstances it may be used as a cover-crop to plow under. The seed may be sown any time from April to August, but in orchards it had better be sown in July. Sow at the rate of six quarts per acre. The seed being small, it should be lightly harrowed in upon a well-fitted soil. It is very persistent in the production of seed, and upon fertile soils it will maintain itself for several years unless thorough cultivation is given. Where soils are in fair condition and other crops will grow, it is doubtful if Spurry has any place. Sometimes written Spurrey.



2381. A Y-fixture with Bordeaux brand of nozzle.

A. CLINTON.

SQUASH (Plate XXXVII) is a name adapted from an American Indian word, and is applied in an indefinite way to various plants of the genus Cucurbita. The application of the name does not conform to the specific lines of the plants. What are called summer Squashes are mostly varieties of *Cucurbita Pepo.* The winter Squashes are either *C. maxima* or *C. moschata*, chiefly the former. If the name Squash belongs to one species more than to another, this species is probably *C. maxima.* See *Cucurbita*, particularly the note on p. 410. The pictures show some of the forms of these species. Plate XXXVII is the Hubbard Squash, *Cucurbita maxima.* Fig. 2382 is the Winter or Canada Crookneck, one of the forms of *C. moschata.* Figs. 2383–88 are forms of the multifarious *Cucurbita Pepo.* Fig. 2388 shows the Vegetable Marrow, much prized in England.

Squashes and pumpkins are very easy plants to grow, provided they are given a warm and quick soil. They are long-season plants, and therefore in the North they are very likely to be caught by frosts before the full crop has matured, unless the plants are started early and make a rapid and continuous growth early in the season. In hard, rough clay lands the plants do not get a foothold early enough to allow them to mature the crop. On such lands it is impossible, also, to plant the seeds early. As a consequence, nearly all Squashes are grown on soils of a loose and relatively light character. Sandy lands or sandy loams are preferred.

On very rich bottom lands the plants often thrive remarkably well, but there is danger that the plants may run too much to vine, particularly true when the soil has too much available nitrogen. In order that the plants shall start quickly, it is necessary that the soil be in excellent tilth. It is customary, with many large growers, to apply a little commercial fertilizer to the hills in order to give the plants a start. A fertilizer somewhat strong in nitrogen may answer this purpose very well; but care must be taken not to use nitrogen too late in the season, else the plants will continue to grow over-vigorously rather than to set fruit.

2382. Winter or Canada Crookneck Squash—Cucurbita moschata.

Cultural groups of Squashes are of two general kinds, the bush varieties and the long-running varieties. The bush varieties are usually early. The vines run very little, or not at all. The various summer Squashes belong to this category, and most of them are varieties of *Cucurbita Pepo*. The hills of bush varieties are usually planted as close together as 4x4 feet. On high-priced land they are often planted 3x4 feet. The long-running varieties comprise the fall and winter types; and to this category may also be referred, for cultural purposes, the common field pumpkins. There is much difference between the varieties as to length of vine. On strong soils, some varieties will run 15–20 feet, and sometimes even more. These varieties are planted from 8–12 feet apart each way. Sometimes they are planted in corn fields, and they are allowed to occupy the ground after tillage for the corn is completed.

For general field conditions, the seeds of Squashes are usually planted in hills where the plants are to stand. If the land is mellow and rich, these hills are nothing more than a bit of ground 12–18 inches across, which has been freshly hoed or spaded and leveled off. On this hill, from six to ten seeds are dropped, and they are covered an inch or less in depth. In order to provide the seeds with moisture, the earth is usually firmed with the hoe. When the very best results are desired, particularly for the home garden, hills may be prepared by digging out a bushel of soil and filling the place with rich earth and fine manure. It is expected that not more than three to five of the plants will finally be left to each hill; but there are many contingencies to be considered. The young plants may be taken off by cutworms or by other insects, or they may be caught by frost.

2383. Summer Crookneck Squash—Cucurbita Pepo form.

If it is necessary to start the plants in advance of the season, the seeds may be planted in pots or boxes in a forcing-house or hotbed about three weeks before it is time to set them in the field. If the seeds are started much earlier than this, the plants are likely to get too large and to become stunted. When set in the field, the roots should fill the pot or box so that the earth is held in a compact ball, and the plant should be fresh, green and stocky. Plants that become stunted and develop one or two flowers when they are in the box are usually of little use. Sometimes seeds are planted directly in the field in forcing hills, and when the plants are established and the season is settled the protecting box is removed and the plants stand in their permanent positions.

A good Squash vine should produce two or three first-class fruits; if, however, one flower sets very early in the season, the vine may devote most of its energies to the perfection of that single fruit and not set many others, or may set them too late in the season to allow them to mature. If it is desired, therefore, that the plants shall produce more than one fruit, it is advisable to pick off the first fruit, providing it sets long in advance of the appearance of other pistillate flowers. These remarks apply particularly to winter squashes in northern regions. With small varieties and under best conditions, as many as a half-dozen fruits may be got from a single vine, and in some cases this number may be exceeded. Squash vines tend to root at the joints; but under general conditions this should be prevented, because it tends to prolong the growing season of the vine. It is usually well, therefore, to lift the joints occasionally when the hoeing is done, although the vine should not be moved or disturbed. This precaution applies particularly in the short-season climates of the North, where every effort must be made to enable the plant to set its fruit early in the season and to complete its growth before fall.

2384. Summer Bergen Squash, a form of Cucurbita Pepo.

There are several enemies and diseases of the Squash. Perhaps the most serious is the striped cucumber beetle, which destroys the tender young plants. This insect is destroyed with the arsenites; but since it works on the under sides of the leaves as well as on the upper, it is difficult to make the application in such way as to afford a complete protection. The insects also are likely to appear in great numbers and to ruin the plants even whilst they are getting their fill of arsenic. If the beetles are abundant in the neighborhood, it is best to start a few plants very early and to plant them about the field in order to attract the early crop of bugs, thereby making it possible to destroy them. From these early plants the bugs may be hand-picked, or they may

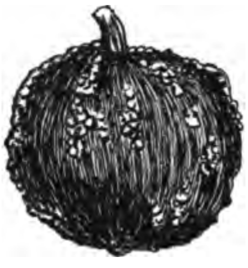
2385. The Pineapple Summer Squash, one of the Scallop or Pattypan type—Cucurbita Pepo.

be killed with very heavy applications of arsenites,—applications so strong that they may even injure the plants. Sometimes the hills of Squashes are covered with wire gauze or mosquito netting that is held above the earth by means of hoops stuck into the ground. This affords a good protection from insects that arrive from the outside, providing the edges are thoroughly covered with earth so that the insects cannot crawl under; but if the insects should come from the ground beneath the covers they will destroy the plants, not being able to escape. The Squash bug or stink bug may be handled in the same way as the striped cucumber beetle. This insect, however, remains throughout the season and, in many cases, it is necessary to resort to hand-picking. The insects delight to crawl under chips or pieces of board at night, and this fact may be utilized in catching them. The mildews of Squashes may be kept in check with more or less certainty by the use of Bordeaux mixture or ammoniacal carbonate of copper.

The varieties of pumpkins and Squashes are numerous, and it is difficult to keep them pure if various kinds are grown together. However, the true Squashes (*Cucurbita maxima*) do not hybridize with the true pumpkin species (*Cucurbita Pepo*). There need be no fear, therefore, of mixing between the Crookneck or Scallop Squashes and the varieties of Hubbard or Marrow types. The summer or bush Squashes are of three general classes: the Crooknecks, the Scallop or Pattypan varieties, and the Pineapple or oblong-conical varieties. All these are forms of *C. Pepo*. The fall and winter varieties may be thrown into several groups: the true field pumpkin, of which the Connecticut Field is the leading representative, being the one that is commonly used for stock and for pies; the Canada Crookneck or Cushaw types, which are varieties of *C. moschata;* the Marrow and Marblehead types, which are the leading winter Squashes and are varieties of the *C. maxima;* the Turban Squashes, which have a "Squash within a Squash" and are also varieties of *C. maxima*. The mammoth pumpkins or Squashes which are sometimes grown for exhibition and which may weigh two or three hundred pounds, are forms of *C. maxima*.

2386. Connecticut or Common Field Pumpkin—Cucurbita Pepo.

Thoroughly sound and mature Squashes can be kept until the holidays, and even longer, if stored in a room that is heated to 20° above freezing. If the Squashes are not carefully handled the inside of the fruit is likely to crack. Squashes that have been shipped by rail seldom keep well. The philosophy of keeping a winter Squash is to prevent the access of germs (avoid all bruises and cracks and allow the end of the stem to dry up), and then to keep the air dry and fairly warm. The fruits are usually stored on shelves in a heated shed or outhouse. The following advice is given for this occasion by W. W. Rawson: "Cut the Squashes just before they are thoroughly ripe. Be careful not to start the stem in the Squash. Lay them on the ground one deep and let them dry in the sun two or three days before bringing to the building. Handle very carefully when putting in, and be sure that the wagon in which they are carried has springs. Put them two deep on shelves in a building. This should be done on a cool, dry day. If the weather continues cool and dry, keep them well aired by day; but if damp weather comes build a small fire in the stove in order to dry out the green stems. Keep the temperature about 50°, and air well in dry weather. The Squashes may need picking over about Christmas if put in the building about October 1; handle very carefully when picking over. Fifty tons can be kept in a single building with a small fire. Do not let them freeze, but if temperature goes down to 40° at times it will do no harm; nor should it be allowed to go as high as 70°. The Hubbard Squash keeps best and longest and does not shrink in weight as much as other kinds; but any of them will shrink 20 per cent if kept until January 1."


2387. The Negro Squash. One of the warty forms of *Cucurbita Pepo.*

L. H. B.

SQUASH, GUINEA, or EGGPLANT. See *Solanum Melongena* and *Eggplant.*

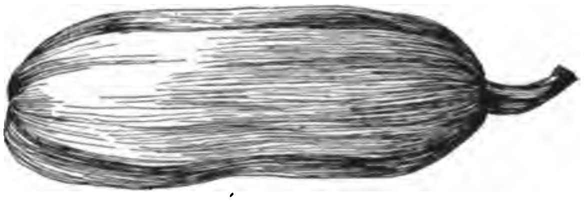
SQUAW BERRY. *Mitchella repens.*

SQUILL. For the garden Squill, see *Scilla*. For the medicinal Squill, see *Urginea.*

SQUIRREL CORN. *Dicentra Canadensis.*

SQUIRTING CUCUMBER. *Ecballium Elaterium.*

STÁCHYS (from an old Greek name applied by Dioscorides to another group of plants, coming from the word for *spike*). *Labiàtæ.* WOUNDWORT. A genus of perhaps 150 species distributed mainly in temperate countries: perennial or annual herbs, rarely shrubby, with opposite simple, entire or dentate leaves and mostly small flowers, ranging from purple, red, pale yellow to white, sessile or short-pediceled, in axillary whorls or terminal dense spikes: calyx 5-dentate, teeth equal or the posterior larger; corolla-tube cylindrical, 2-lipped, the posterior usually villous, concave or fornicate, rarely somewhat flat; stamens 4, didynamous, the anterior longer, ascending under the upper lip and very little exserted, often deflexed after anthesis. Very few of the species are cultivated, although there are several with showy spikes. They are usually found in moist or even wet places when growing wild. A tuber-bearing species (*S. Sieboldi*) has lately come into notice as a kitchen-garden plant.

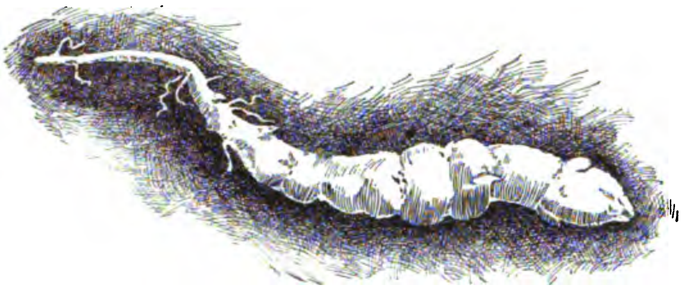

2388. Vegetable Marrow—Cucurbita Pepo.

A. *Plants grown for the showy spikes of fls. or for foliage.*

B. *Corolla-tube twice or more exceeding the calyx.*

Betónica, Benth. (*Betónica officinàlis,* Linn.). BETONY. A hardy perennial herb 1–3 ft. high: lower leaves long petioled, ovate-oblong, crenate, obtuse, cordate at the base, 3–6 in. long; upper leaves distant, sessile, oblong-lanceolate, acute: fls. purple, in a dense, terminal spike. July. Eu., Asia Minor.—Rarely found as an escape in this country, and once cult. for use in domestic medicine. Useful for ornament, and now advertised for that purpose.

longifòlia, Benth. (*Betónica orientàlis*, Linn.). A hardy perennial herb about 1 ft. high, densely villous. lower lvs. petioled, oblong-lanceolate, obtuse, crenate, deeply cordate at the base, 4–6 in. long; the upper lvs. similar in shape but sessile, those of the inflorescence bract-like: fls. reddish purple to pink, in a cylindrical, somewhat interrupted spike about ½ ft. long. July. Caucasus.



2389. Tuber of Stachys Sieboldi (× ¾).

grandiflòra, Benth. (*Betónica ròsea*, Hort.). A hardy perennial about 1 ft. high: lower lvs. broadly ovate, obtuse crenate, long-petioled, base broadly heart-shaped; the upper gradually smaller, nearly similar and sessile, the uppermost bract-like: fls. violet, large and showy, the curving tube about 1 in. long and three or four times surpassing the calyx, in 2–3 distinct whorls of 10–20 fls. each. Asia Minor, etc. B.M. 700.

coccínea, Jacq. One to 2 ft., slender, soft-pubescent: lvs. ovate-lanceolate, cordate at base or somewhat deltoid, obtuse, crenate: fls. scarlet-red, the narrow tube much exceeding the calyx, pediceled, in an interrupted spike, blooming in succession. Western Texas to Ariz. B.M. 666.—Showy.

BB. *Corolla-tube little exceeding the calyx.*

C. *Herbage green.*

áspera, Michx. Erect, usually strict, 3–4 ft. high, the stem retrorsely hairy on the angles: lvs. oblong-ovate to oblong-lanceolate, mostly acuminate, serrate, petiolate: corolla small, glabrous, pale red or purple, in an interrupted spike. Wet places, Ontario and Minnesota to the Gulf.—Has been offered by dealers in native plants.

CC. *Herbage white-woolly.*

lanàta, Jacq. WOOLLY WOUNDWORT. A hardy perennial 1–1½ ft. high, white-woolly throughout: lvs. oblong-elliptical, the upper smaller, the uppermost much shorter and whorled: fls. small, purple, in dense 30- or more fld. whorls in interrupted spikes. Caucasus to Persia.—Often grown as a bedding plant. Valuable for its very white herbage.

AA. *Plants grown for edible subterranean tubers.*

Sièboldi, Miq. (*S. affinis*, Bunge, not Fresenius. *S. tuberifera*, Naud.). CHOROGI. CHINESE OR JAPANESE ARTICHOKE. KNOTROOT. CROSNES DU JAPAN. Fig. 2389. Erect, hairy mint-like plant, growing 10–18 in. tall: lvs. ovate to deltoid-ovate to ovate-lanceolate, cordate at base, obtuse-dentate, stalked: fls. small, whitish or light red, in a small spike: tubers (Fig. 2389) 2–3 in. long, slender, nodose, white, produced in great numbers just under the surface of the ground. China, Japan. G.C. III. 3:13.—Sent to France in 1882 from Pekin by Dr. Bretschneider, and about ten years ago introduced into this country. It is cultivated for the crisp tubers, which may be eaten either raw or cooked. These tubers soon shrivel and lose their value if exposed to the air. The tubers withstand the winter in central New York without protection, so that a well-established plant takes care of itself and spreads. For history, chemical analyses, etc., see Cornell Bull. 37.

Floridàna, Shuttlew. Slender, erect, 1–2 ft., branching, glabrous: lvs. cordate-oblong-lanceolate, blunt-toothed, stalked: fls. small, light red, in an open interrupted spike: tubers cylindrical, uniformly nodose, 4–6 in. long. Fla.—Has been tested abroad as a food plant, and also at the Cornell Exp. Sta. (see Bull. 61), but practically unknown horticulturally. The tubers are fully as good, for eating, as those of *S. Sieboldi*.

L. H. B.

STACHYTARPHÈTA (Greek, *dense spike*). *Verbenàceæ*. About 40 species of herbs or shrubs, mainly from tropical America, with opposite or alternate, dentate, often rough leaves and white, purple, blue or red flowers solitary in the axils of bracts, sessile or half sunk in the rachis of the long and dense or short and lax spikes.

mutábilis, Vahl. A low shrub, scabrous-pubescent: lvs. ovate, dentate, scabrous above, whitish pubescent beneath: spike long, erect: bracts lanceolate, subulate: calyx 4-dentate, hispid, 4–6 lines long; corolla crimson, fading to rose, ½–¾ in. across. West Indies, Mexico to Guiana. Offered in S. Calif.

F. W. BARCLAY.

STACHYÙRUS (Greek, *spike* and *tail;* in allusion to the form of the inflorescence). *Ternstrœmiàceæ*. Two species of glabrous shrubs or small trees, one from the Himalayas and the other from Japan, with membranous, serrate leaves and small flowers in axillary racemes or spikes: fls. 4-merous; sepals strongly imbricated; stamens 8, free; style simple: berry 4-loculed.

præcox, Sieb. & Zucc. Rambling shrub, 10 ft. high, with flexible branches: lvs. deciduous, ovate to ovate-lanceolate, 4–6 in. long, thin; petiole about 1 in. long: spikes 2–3 in. long, many-fld., stout: fls. ⅓ in. across, globular-bell-shaped, sessile or nearly so: fr. globose or ovoid, ⅓–½ in. thick: seeds pale brown. Japan. B.M. 6631. G.C. III. 21:285.—Procurable from importers of Japanese plants.

STACKHOÙSIA (after John Stackhouse, an English botanist). *Stackhousiàceæ*. About 10 species from Australia and sparingly from other islands of the S. Pacific ocean. Mostly perennial herbs with slender, erect stems and narrow, entire, often fleshy leaves and terminal spikes of flowers. The genus is the only one of the order: fls. regular, hermaphrodite; calyx small, 5-lobed; petals 5, perigynous, clawed, usually free at base but united above in a tube with spreading lobes; disk thin, lining the calyx-tube; stamens 5, inserted on the margin of the disk: ovary free, 2–5-lobed, 2–5-loculed: fr. of 2–5 indehiscent cocci. Consult Flora Australiensis 1:405.

monógyna, Labill. (*S. linariifòlia*, A. Cunn.). A half-hardy perennial herb, usually simple, about 1½ ft. high, with linear or lanceolate lvs. about 1 in. long: spikes at first dense, then lengthening to 4–6 in.: buds pinkish when young: fls. white. B.R. 22:1917.—The plant in the Californian trade is apparently not the above species, for the catalogue says it is a tall, robust shrub with fl.-heads 1–2 in. across, surrounded by imbricated bracts and bright yellow fls. with a purple-streaked keel.

F. W. BARCLAY.

STADMÁNNIA (named by Lamarck in 1793 after a German botanist and traveler). *Sapindàceæ*. The only species of this genus that is well known is a tropical tree from the Bourbon Islands, there known as *Bois de fer* or Ironwood. This is a large tree with hard, heavy reddish wood, once frequent in the primeval forests of Mauritius but now scarce. It is not known to be in cultivation in America. The proper name of this tree is *Stadmannia oppositifòlia*, Lam., a synonym of which is *S. Sideróxylon*, DC. Nine other names appear in Index Kewensis, apparently all Brazilian species, but one of them is a bare name and the others were first described in the early sixties in Linden's catalogue. They are therefore very uncertain names, and the following diagnosis of the genus (taken from Baker's "Flora of Mauritius and the Seychelles," 1877) is probably sufficiently inclusive. Fls. regular, polygamous; calyx a deep cup, with 5 obscure, deltoid teeth; petals none; disk thick, elevated, lobed; stamens 8, regular, exserted: style short; stigma capitate: ovary deeply 3-lobed, 3-loculed; ovules solitary in each cell; fr. usually 1-celled by abortion, large, dry, round, indehiscent.

The generic name is sometimes written Stadtmannia, a spelling which is said to be an error dating back to Walpers' Annales (1851–52). *S. amabilis* is an American trade name which seems to be practically unknown to science. H. A. Siebrecht says it is "an imposing decorative plant for stove culture." He adds that it requires the treatment given *Fatsia Japonica* and Gardenias. Give heavy loam. Propagated by cuttings under glass, or out of doors in summer.

S. oppositifòlia, Lam. (S. Sideróxylon, DC.). BOIS DE FER. Lvs. alternate, petioled, abruptly pinnate: lfts. 8–12, opposite, oblong, short-stalked, obtuse, coriaceous, entire, oblique at base: panicles dense, cylindrical, 3–4 in. long: fr. hard, globular, nearly 1 in. thick.

W. M.

STAGHORN FERN. *Platycerium.*

STAGHORN SUMACH. See *Rhus.*

STANDING CYPRESS. *Gilia coronopifolia.*

STANGÈRIA (Wm. Stanger, surveyor-general of Natal; died 1854). *Cycadàceæ.* **Stangèria paradóxa,** T. Moore, is unique among the cycads by reason of the venation of its leaflets. In all the other members of the family the veins of the leaf-segments are parallel and horizontal; in this one plant they are all free and run directly from the midrib to the margin. This pinnate venation is so extraordinary that the plant looks more like a fern than a cycad, and in fact it was so described before the fruits were known. Stangeria is a South African plant with an odd turnip-shaped stem (properly caudex or rhizome), at the top of which are 3–4 handsome leaves each 2 ft. long and 1 ft. broad, with about 12 pairs of leaflets which are fern-like and unusually broad for the family. This plant was introduced to the American trade by Reasoner Bros., of Oneco, Fla., in 1890, but it is little known in cultivation in this country.

All the cycads have a high reputation among connoisseurs as decorative foliage plants for warm conservatories. The most popular is *Cycas revoluta*, which see for cultural suggestions. The flowers and fruits in this family are very singular and interesting. The male cones of Stangeria are 6 inches long and an inch or so in width. The female cones are much smaller, 2–3 in. long. The structure of the cones and fruits shows that Stangeria is closely related to Encephalartos. The species above mentioned is probably the only one, but it seems to have several well-marked varieties. For a fuller account see B.M. 5121.

W. M.

STANHÒPEA (named for the Earl of Stanhope, president of the Medico-Botanical Society, London). *Orchidàceæ.* A genus of about 20 species inhabiting tropical America from Mexico to Brazil. These plants are easily grown and very interesting, but the fugacious character of their flowers has been unfavorable to their extensive cultivation. The flowers are produced on thick scapes, which bore their way through the material in which they are planted and emerge from the bottom of the basket. The flowers expand with a perceptible sound early in the morning. They are large, fragrant, and curiously formed. The sepals and petals are usually reflexed; they are subequal or the petals are narrower. The labellum is remarkably transformed. The basal part or hypochil is boat-shaped or saccate, often with two horns on the upper margin. This passes gradually into the mesochil, which consists of a fleshy central part and two lateral horns. The terminal lobe or epichil is firmly or movably joined to the mesochil. It is usually fleshy and keeled but not saccate. The base of the labellum is continuous with the long-winged column. Pseudobulbs clustered on the short rhizome, sheathed with scales and each bearing a single large plaited leaf contracted to a petiole at the base.

HEINRICH HASSELBRING.

Stanhopeas enjoy a shady, moist location. A temperature of 60–65° F. at night and 70–75° during the day should be maintained in winter, with a gradual advance of 10° toward midsummer. They should be grown suspended from the roof in orchid cabins or terra cotta baskets with large openings at the bottom, and if drainage is used it should be placed in such a manner that it will not interfere with the exit of the pendulous flower scapes. Equal parts chopped sphagnum and peat fiber forms a good compost. By severing the rhizome here and there between the old pseudobulbs, new growths will be sent up and thus the stock may be increased.

R. M. GREY.

INDEX.

atrata, 9.
aurea, 2.
bicolor, 10.
Bucephalus, 4.
Devoniensis, 7.
eburnea, 1.
ecornuta, 12.
grandiflora, 1, 4.
insignis, 6.
lutescens, 9.
maculosa, 7.
Martiana, 10.
oculata, 3.
platyceras, 5.
radiosa, 11.
saccata, 11.
Shuttleworthii, 8.
superba, 9.
tigrina, 9.
Wardii, 2.

A. *Labellum with an excavated or saccate base and a plane terminal lobe.*
  B. *Mesochil and pleuridia wanting* .... 1. **eburnea**
  BB. *Mesochil and pleuridia present.*
    C. *Hypochil boat-shaped, short and sessile* .... 2. **Wardii**
    CC. *Hypochil boat-shaped, long and stalked* .... 3. **oculata**
      4. **Bucephalus**
      5. **platyceras**
    CCC. *Hypochil saccate or globose.*
      D. *Epichil entire or obsoletely 3-toothed at the apex* .... 6. **insignis**
        7. **Devoniensis**
        8. **Shuttleworthii**
      DD. *Epichil evidently 3-toothed at the apex* .... 9. **tigrina**
        10. **Martiana**
        11. **saccata**
AA. *Labellum reduced to a saccate pouch* ....12. **ecornuta**

1. **ebúrnea,** Lindl. (*S. grandiflòra*, Lindl.). Pseudobulbs conical, 1½ in. long: lvs. leathery, 8–12 in. long: scapes pendulous, with small bracts, 2–3-fld.: fls. 5 in. across, ivory white; sepals broad; petals narrow; labellum 3 in. long, solid, fleshy, excavated at the base and bearing 2 hooked horns over the mouth, spotted above with reddish purple; column pale green, with broad wings toward the apex. Guiana. B.M. 3359. B.R. 18:1529. I.H. 14:531 (var. *spectabilis*). L.B.C. 15:1414 (as *Ceratochilus grandiflorus*). B. 4:176.

2. **Wárdii,** Lodd. Pseudobulbs 2 in. long: lvs. large, broad and leathery: flower-stem 9 in. long, bearing 3–9 fls., which are bright yellow to golden orange, spotted with crimson; lateral sepal round-oblong, concave, acute; petals lanceolate, revolute, the cavity in the base of the labellum deep velvety purple. Aug. Mex. and S. B.M. 5289.—Var. **aùrea,** Hort. (*S. aùrea*, Lodd.). Fls. golden yellow, with 2 dark spots on the hypochil. Fragrant.

3. **oculàta,** Lindl. Lvs. ovate, with a blade 1 ft. long: scape 1 ft. long, clothed with scarious pale brown sheaths, 3–6-fld.: fls. 5 in. across, very fragrant, pale yellow, thickly spotted with purple; sepals 3 in. long, reflexed; petals one-half as large; hypochil narrow, white, spotted with crimson and having 2 large dark brown spots near the base. Mexico. B.M. 5300. B.R. 21:1800. L.B.C. 18:1764 (as *Ceratochilus oculatus*). S.H. 2, p. 435. G.C. III. 19:264. Gn. 56:1450.—Distinguished from *S. Bucephalus* and *S. Wardii* by the paler color and long, narrow hypochil. There are several varieties, differing in color and markings.

4. **Bucéphalus**, Lindl. (*S. grandiflòra*, Reichb. f.). Pseudobulbs crowded, rugose: lvs. petioled, 9 in. long, pointed: the pendulous raceme bearing 4–6 large, tawny orange fls. marked with large crimson spots: sepals and petals reflexed, the former broad; lower part of the labellum curved, boat-shaped, bearing 2 curved horns and a broad fleshy middle lobe; column green and white, spotted with purple. Aug. Mexico, Peru. B.M. 5278. B.R. 31:24.—Fls. very fragrant. Distinguished by its very short ovaries.

5. **platycèras**, Reichb. f. Pseudobulbs and lvs. as in *S. Bucephalus* but stouter: scape 2-fld., with ovate acute bracts one-half as long as the ovary: fls. 7 in. across, pale yellow, with numerous ring-shaped spots and blotches of purple; sepals triangular oblong; petals broadly linear, acute; hypochil boat-shaped, 2⅜ in. long; horns 1 in. long, broad, pointing forward, parallel with the tongue-shaped middle lobe; the hypochil is deep purplish crimson inside, paler and spotted outside, the upper part of the labellum colored like the sepals. Colombia. Gn. 33:652.

6. **insignis**, Frost. Figs. 2390, 2391. Pseudobulbs clustered: lvs. broadly lanceolate: scape 6 in. long, covered with dark brown scales, 2–4-fld.: fls. 5 in. across, dull yellow, spotted with purple; sepals broad, concave; petals narrow, wavy; hypochil globose, almost wholly purple inside, heavily spotted outside, horns 1 in. long, falcate, middle lobe cordate, keeled. July–Oct. Brazil. B.M. 2948, 2949. B.R. 22:1837. L.B.C. 20:1985. Gng. 2:117 (from which Fig. 2290 is adapted).—Distinguished by the broad wings of the column.

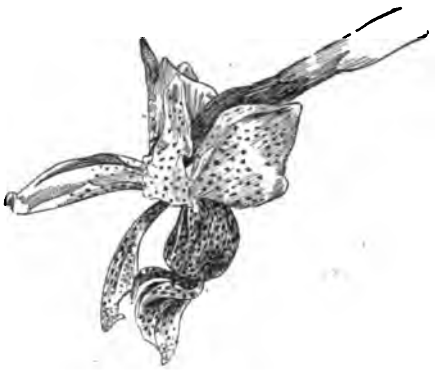
7. **Devoniénsis**, Lindl. (*S. maculòsa*, Knowles & W.). Lvs. about 9 in. long: scape pendulous, 2–3-fld.: fls. 5 in. across, pale brownish, with broad reddish brown blotches; sepals oblong to ovate-oblong, obtuse; petals narrow; hypochil rounded, saccate, purple, horns incurved, middle lobe ovate, channeled, obscurely 3-toothed. Peru. F.S. 10:974. F.C. 3:121.

8. **Shúttleworthii**, Reichb. f. Pseudobulbs large, conical, sulcate: lvs. broadly oblong, acute: raceme pendulous, loose: sepals, petals and base of the labellum apricot color with dark purplish blotches, front part of the labellum yellowish white; hypochil semi-globose; horns flattened, suberect, terminal lobe triangular: column whitish, green along the middle and spotted with purple on the inside. Colombia.

9. **tigrina**, Batem. Lvs. and pseudobulbs as in the genus: scape short, pendulous, clothed with large, thin brown scales: fls. 6 in. across, waxy and very fragrant; sepals broadly ovate, concave; petals oblong-lanceolate, both dingy yellow mottled towards the base with large blotches of dull purple; hypochil broad, cup-shaped; horns 1 in. long, fleshy, bent forward at right angles; middle lobe rhomboid, with 3 fleshy teeth at the apex; column large, spatulate. Mexico. B.M. 4197. B.R. 25:1. G.M. 32:398; 38:149. F. 1845:59. G.C. III. 4:481.—One of the most striking forms among orchids. Var. **lutéscens**, Hort. Brilliant yellow to orange marked with chocolate. Guatemala. Var. **supérba**, Hort. Van Houtte. Fls. yellow, with the sepals and petals heavily blotched with reddish brown. F.S. 7:713. Var. **atràta**, Hort., is adv.

2390. Stanhopea insignis.

10. **Martiàna**, Batem. Lvs. lanceolate: sepals broadly ovate, creamy white with few purple spots on the lower half; petals narrower, blotched with purplish crimson, hypochil saccate, white; lateral horns broad, pointed, middle lobe oblong, obscurely 3-toothed; column subclavate, winged. Mexico. F.S. 20:2112. Gn. 45, p. 470. —Var. **bicolor**, Lindl. Ground color of the fls. white. B.R. 29:44.



2391. Stanhopea insignis (× ⅛).

11. **saccàta**, Batem. Fls. smaller than those of the other species, greenish yellow, changing to deeper yellow at the bases of the segments, regularly speckled with brown; lateral sepals ovate-oblong, the upper one oblong-lanceolate; petals narrower, oblong, all reflexed; hypochil deeply saccate; horns flat, a little twisted, epichil quadrate. Guatemala. I.H. 8:270 (as *S. radiosa*).

12. **ecornùta**, Lem. Pseudobulbs and lvs. large: scape short, clothed with green bracts, 2-fld.: sepals erect, 2 in. long, ovate, concave, white, petals smaller; labellum reduced to a fleshy sac-like hypochil, 1½ in. long, yellow deepening to orange at the base; column as long as the labellum and of the same color. Cent. Amer. B.M. 4885. F.S. 2:181. G.C. 1850:295.

S. Amesiàna, Hort. Hugh Low, belongs to the hornless class of which S. ecornuta is a type and is perhaps a variety of S. Lowii. It has large, waxy, clear white, fragrant fls. over 4 in. across, and a very thick, fleshy, saccate labellum. G.M. 36:352. Habitat?

HEINRICH HASSELBRING.

STÁNLEYA (Edward Stanley, Earl of Derby, 1779–1849, ornithologist, once president Linnean Society). *Cruciferæ*. *Stanleya pinnatifida* is a hardy perennial herb about 3 ft. high with the general appearance of a Cleome and bright yellow flowers an inch across borne in terminal spikes a foot or more long. The genus contains 5 species of stout herbs native to the western U. S. It belongs to the Sisymbium tribe of the mustard family, which tribe is characterized by long, narrow pods, seeds in a single series and incumbent cotyledons. Stanleya is distinguished from neighboring genera by the long, club-shaped buds, cream-colored or yellow fls., and long-stalked ovaries and pods. Other generic characters: sepals linear; petals narrow, long-clawed; stamens 6, nearly equal: seeds numerous, pendulous.

pinnatífida, Nutt. (*S. pinnàta*, Britton). Stems flexuous: lvs. very variable, commonly pinnatifid; segments lance-oblong or oblanceolate-elliptic, rarely linear, almost entire; terminal segment larger: fls. deep golden yellow, according to D. M. Andrews. May–July. W. Kan. and Neb. to Tex. and S. Calif., in dry clay or alkaline soils. B.B. 2:109.—Procurable from collectors of Colorado wild flowers.

W. M.

STAPÈLIA (J. B. Van Stapel, Dutch physician, died in the early part of the seventeenth century, who wrote on the plants of Theophrastus). *Asclepiadàceæ*. CARRION FLOWER. Odd fleshy cactus-like plants from South Africa. Schumann, in Engler and Prantl's "Naturpflanzenfamilien," considers that the genus contains 70–80 species. Decaisne, in DeCandolle's Prodromus, 8 (1844), describes 89 species, and makes references to several more. The Stapelias are usually grown with greenhouse succulents, both for the great oddity of their forms and for the singular and often large, showy flowers. The plants are leafless. The strongly angled usually 4-sided green branches or stems are generally more or less covered with tubercles and excrescences. The flowers commonly arise from the angles and notches of the stems, apparently in no regularity, and they are usually grotesquely barred and mottled with dark or dull colors. They generally emit a strong and carrion-like odor. The calyx and corolla are 5-parted; corolla-segments spreading and usually narrow, usually fleshy, mostly purple or marbled, in some species pale; crown comprising 2 series of scales or bracts, of which the inner are narrower, each series in 5's but the scales sometimes lobed or bifid: fr. of 2 follicles, containing comose seeds. Some of the species have flowers several inches across, although the plants themselves are relatively small; in fact, the flowers of *S. gigantea* are a foot across.

The Stapelias are easy of cultivation. Most of the species demand the treatment given to Cape Euphorbias and to cacti,—a light, airy, rather dry position during the growing and blooming seasons and a soil made porous with rubble. They are mostly summer and fall bloomers. They should remain dormant in winter. Propagated easily by cuttings. They do best, however, when not grown so dry as cacti are grown.

The Stapelias are known in cultivation mostly in botanic gardens and in the collections of amateurs. Only 5 names now occur in the American trade, and one of these belongs properly in the genus Echidnopsis. Several other species are likely to be found in fanciers' collections.

A. *Corona formed only of the cohering anthers. Echidnopsis.*

cylíndrica, Hort. This is properly *Echidnópsis cereifórmis*, Hook. f., omitted from Vol. II, but known in the trade as a Stapelia: stems cylindrical, tufted, 1–2 ft. long, becoming recurved or pendulous at the ends, ¾ in. or less thick, nearly or quite simple, 8-grooved and marked by shallow transverse depressions: fls. arising from furrows in the stem, small (about ¼ in. across), yellow, sessile. Probably South African, but habitat unknown. B.M. 5930.

AA. *Corona with scales.*

B. *Fls. pale yellow, about 1 ft. across.*

gigantèa, N.E. Br. The largest and finest species yet known, and one of the largest and oddest of flowers: branches many, usually less than 1 ft. long, obtusely 4-angled: as described by W. Watson, "the flowers are a foot in diameter, leathery-like in texture, the surface wrinkled and the color pale yellow, with red-brown transverse lines and covered with very fine silky purplish hairs; each flower lasts two or three days, and on first opening emits a disagreeable odor." Zululand. B.M. 7068. G.C. II. 7:693; III. 4:729. G.F. 8:515.—"The requirements of *S. gigantea*," Watson writes, "are somewhat exceptional. It thrives only when grown in a hot, moist stove from April till September, when the growth matures and the flower-buds show. It should then be hung up or placed upon a shelf near the roof-glass in a sunny dry position in the stove."

BB. *Fls. yellow, 3 in. or less across.*

variegàta, Linn. (*S. Cúrtisii*, Schult.). About 1 ft. tall, with 4-angled sharply toothed stems: fls. solitary, sulfur-yellow, the lobes ovate-acute and transversely spotted with blood-red. B.M. 26. R.H. 1857, p. 43.—An old garden plant, still seen in collections, often under the name *S. Curtisii.*

BB. *Fls. purple, 6 in. or less across.*

grandiflòra, Mass. Fig. 2392. About 1 ft. tall, gray-pubescent, the branches 4-wing-angled and toothed: fls. 4 or 5 in. across, dark purple with a lighter shade on the segments, striped or marked with white, hairy. R.H. 1858, p. 154.—An old garden plant.

glabrifòlia, N. E. Br. (*S. grandiflòra*, var. *minor*, Hort.). Fls. somewhat small and not hairy, the segments becoming strongly reflexed, dull purple-red with yellowish white lines. G.C. II. 6:809.

S. Astèrias, Mass. STARFISH FLOWER. Dwarf: branches 4-angled, mostly curved, sharp-toothed: fl. 4 or 5 in. across, with spreading star-like ciliate segments, violet-purple with transverse yellowish bars. B.M. 536. L.B.C.5:453. Offered by Blanc, 1893.—*S. Bufònis*, Sims = S. normalis.—*S. normàlis*, Jacq. About 6–8 in.: branches 4-angled, with large, spreading teeth, glabrous: fl. 2–3 in. across, with ovate-acute segments, yellow with transverse marking of red-purple. B.M. 1676. Gn. 52, p. 186. One of the commonest of the old kinds, but the name does not appear in the American trade.—*S. Plántii*, Hort. Stems stout and erect, strongly 4-angled, sinuate-toothed and with inflexed points: fl. about 5 in. across, hairy, brown barred with yellow, the margins of the segments brown-purple. B.M. 5692. F.S. 19:2012.

In 1893, Blanc catalogued the following names, in addition to some of those above: *S. anguinea*, Jacq. (properly S. picta, Donn): "Fls. glabrous; corolla yellow, marked with numerous rufous spots; the orb or circle is marked with large spots of two forms, dark brown, yellow."—*S. deflecta* (S. deflexa, Jacq.?): "Only about 2 in. across, the color greenish or pale red, deeply wrinkled."—*S. planiflòra*, Jacq.: "Flower flat; corolla spreading, sulfur-yellow, lined and spotted with dark purple."—*S. revolùta*, Mass.: "Distinct flowers, red, with whitish blotches, smooth, very fleshy, and with fringed margins."—*S. rùfa*, Mass.: "The flowers are of an obscure violet color, variegated with deep purple and pale red transverse stripes, the margins edged with dark violet hairs."—*S. Tsomoénsis*, N. E. Br.: "A very rare species from the Tsomo river. Corolla 3 in. in diameter, the face entirely dull, smoky purple, darker at the tips of the lobes."

L. H. B.

2392. Stapelia grandiflora (× 1-5).

STAPHYLÈA (Greek, *staphyle*, cluster; referring to the inflorescence). *Celastràceæ.* BLADDER NUT. Ornamental deciduous shrubs, with opposite, stipulate odd-pinnate or 3-foliolate leaves and white flowers in terminal, usually nodding panicles followed by capsular bladder-like fruits. The species are all inhabitants of temperate regions, and *S. trifolia*, *S. Bumalda* and *S. pinnata* are hardy north, while *S. Colchica* is hardy at least as far north as Mass.; *S. Bolanderi* and *S. Emodi* are more tender and seem not to be in cultivation in this country. They are all desirable shrubs with handsome bright or light green foliage and pretty white flowers in spring. They are well adapted for shrubberies, but all except *S. Bumalda* are liable to become bare and unsightly at the base and are therefore not to be recommended for single specimens. *S. Colchica* and its hybrid *S. elegans* are perhaps the most beautiful species while in bloom. The former blooms at an early age and is sometimes forced. Staphyleas grow well in almost any kind of soil and position, but do best in a somewhat moist rich soil and partly shaded situation. Prop. by seeds, layers and suckers. Greenwood cuttings from forced plants root readily.

Eight species in the temperate regions of the northern hemisphere: shrubs, with smooth striped bark: lvs. and lfts. stipulate; fls. perfect, 5-merous in terminal panicles; sepals and petals 5, of about the same length, upright; stamens 5; pistils 2–3, usually connate below: fr. a 2–3-lobed, inflated, membranous capsule, with 1 or few subglobose rather large, bony seeds in each cell.

A. *Lvs. 3-foliolate.*

B. *Middle leaflet short-stalked: panicle sessile.*

Bumálda, DC. Shrub, 6 ft. high, with upright and spreading slender branches: lfts. broadly oval to ovate, shortly acuminate, crenately serrate, with awned teeth, light green, almost glabrous, 1½–2½ in. long: fls. about ⅓ in. long, in loose, erect panicles 2–3 in. long; sepals yellowish white, little shorter than the white petals; capsule usually 2-lobed, somewhat compressed, ¾–1 in. long. June. Japan. S.Z. 1:95.

2393. Staphylea trifolia (× ¼).

BB. *Middle leaflet slender-stalked: panicles stalked.*

trifòlia, Linn. AMERICAN BLADDER NUT. Fig. 2393. Upright shrub, with rather stout branches, 6–15 ft. high: lfts. oval to ovate, acuminate, finely and sharply serrate, slightly pubescent beneath or almost glabrous, 1½–3 in. long: fls. about ⅓ in. long, in nodding panicles or umbel-like racemes; sepals greenish white, petals white: capsule much inflated, usually 3-lobed, 1⅓–2 in. long. April, May. Quebec to Ontario and Minn., south to S. C. and Mo. Gt. 37, p. 529.—Var. **pauciflòra**, Zabel. Low and suckering: lfts. smaller, broader, glabrous at length: fls. in short, 3–8-fld. racemes: fr. often 2-lobed, 1⅓–1½ in. long.

AA. *Lfts. 5–7-foliolate, only occasionally 3-foliolate: panicles stalked.*

B. *Panicle raceme-like, oblong, pendulous: fl.-buds subglobose.*

pinnàta, Linn. Upright shrub, attaining 15 ft., sometimes tree-like: lfts. 5–7, ovate-oblong, long-acuminate, sharply and finely serrate, glabrous and glaucescent beneath, 2–3 in. long: panicles 2–5 in. long, on peduncles about 2 in. long: sepals oval, whitish, greenish at the base, reddish at the apex, about as long as the oblong petals: capsule 2–3-lobed, much inflated, subglobose, about 1 in. long. May, June. Europe to W. Asia. Gn. 34, p. 280.

BB. *Panicle broad, ovate, upright or nodding: fl.-buds obovate-oblong.*

Cólchica, Steven. Upright shrub, attaining 12 ft.: lfts. usually 5, sometimes 3, oblong-ovate, acuminate, sharply serrate, glabrous and pale green beneath, 2–3 in. long: panicle 2–3 in. long and almost as broad, on a peduncle 2–3 in. long: sepals narrow-oblong, spreading, yellowish white; petals linear-spatulate, white: capsule obovate, much inflated, 1½–2 in. long. May, June. Caucasus. B.M. 7383. R.H. 1870, p. 257. J.H. III. 34:183. F. 1879, p. 123. G.C. II. 11:117; III. 2:713; 10:161. A.G. 18:423. Gt. 24:837; 37, p. 501. Gn. 34, p. 281.—Var. **Coulombièri**, Zabel (*S. Coulombièri*, André). Of more vigorous growth, with denser foliage: lvs. larger and longer-stalked; lfts. long-acuminate: stamens glabrous: capsule 2–4 in. long, spreading at the apex.

S. Bòlanderi, A. Gray. Allied to S. trifolia: lfts. broadly oval or almost orbicular, glabrous: stamens and styles exserted: fr. 2⅓ in. long. Calif. G.F. 2:545.—*S. élegans*, Zabel. Intermediate between and supposed to be a hybrid of S. pinnata and Colchica: lfts. usually 5: panicles very large and nodding. A very free-flowering variety with pinkish tinged fls. is var. Hessei, Zabel.—*S. Emòdi*, Wall. Shrub or small tree: lfts. 3, oval to oblong, 2–6 in. long: fls. in peduncled, pendulous, raceme-like panicles: fr. 2–3 in. long. Himalayas.

ALFRED REHDER.

STAR APPLE. See *Chrysophyllum.*

STARFISH FLOWER. *Stapelia Asterias.*

STAR FLOWER. *Aster, Trientalis, Triteleia* and other plants.

STAR GRASS is *Chloris truncata.*

STAR OF BETHLEHEM. *Ornithogalum umbellatum.*

STAR THISTLE. *Centaurea.*

STAR TULIP. *Calochortus.*

STARWORT. *Aster.*

STÁTICE (from a Greek name meaning astringent, given by Pliny to some herb). *Plumbaginàceæ.* SEA LAVENDER. About 120 species well scattered about the world, but mainly seacoast plants of the northern hemisphere and especially numerous in Asia. Mostly perennial herbs, rarely annual or shrubby, with usually tufted rather long leaves (radical in the herbaceous species), and small blue, white, red, or yellow flowers. Panicles little branched or much branched, spreading and leafless: bracts subtending the fl.-clusters, scale-like, somewhat clasping, usually coriaceous on the back, and with membranous margins: fls. in dense, few- to several-fld. spikelets, or 1 or 2 in the axils of a bract: spikelets usually erect and unilaterally arranged on the branchlets or more rarely nearly sessile in dense, cylindrical spikes: calyx funnel-shaped, often colored and scarious and persistent. Statice is most readily distinguished from Armeria by the inflorescence, Armeria bearing its flowers in a single globular head.

Statices are of easy cultivation but prefer a rather deep, loose soil. From the delicate nature of the fl.-panicles the species are better suited to rockwork and isolated positions than for mixing in a crowded border. Many of the species are useful for cut bloom, especially for mixing with other flowers.

INDEX.

australis, 8.
Besseriana, 6, 11.
Bonduelli, 7.
collina, 11.
elata, 13.
eximia, 12.
flore-albo, 2.
Fortuni, 8.
Gmelini, 10.
Holfordi, 4.
incana, 6.
latifolia, 14.
Limonium, 9.
macrophylla, 4.
maritima, 9.
nana, 6.
sinuata, 3.
speciosa, 5.
superba, 2.
Suworowi, 1.
Tatarica, 6.

A. *Fls. in long, cylindrical spikes.*
  B. *Spikes in an open panicle* .... 1. **Suworowi**
  BB. *Spikes in dense panicles* .... 2. **superba**
AA. *Fls. in more or less unilateral spikes or clusters.*
  B. *Branches winged.*
    C. *Calyx blue: corolla white.*
      D. *Plant herbaceous* .... 3. **sinuata**
      DD. *Plant shrubby* .... 4. **macrophylla**
    CC. *Calyx whitish: corolla blue* ... 5. **speciosa**
    CCC. *Calyx green or whitish: corolla reddish* .... 6. **Tatarica**
    CCCC. *Calyx and corolla yellow* ..... 7. **Bonduelli**
  BB. *Branches terete or simply angled.*
    C. *Fls. yellow* .... 8. **australis**
    CC. *Fls. not yellow.*
      D. *Calyx blue.*
        E. *Petioles rather long* ..... 9. **Limonium**
        EE. *Petioles short or none* ....10. **Gmelini**
      DD. *Calyx whitish or green*.....
        E. *Bracts green* ....11. **collina**
        EE. *Bracts white-margined.*
          F. *Spikelets 4-fld*........12. **eximia**
          FF. *Spikelets 2-fld*........13. **elata**
          FFF. *Spikelets 1-fld*........14. **latifolia**

1. **Suwórowi**, Regel. A tall annual: lvs. radical, oblanceolate, obtuse, mucronate, 6–8 in. long; margins entire or sinuate: scapes several, stout, obtusely angled,

bearing 1 long terminal spike and several distant, sessile lateral ones 4–6 in. long, nearly ½ in. through: fls. rose, small, nearly sessile, crowded. June, July. Western Turkestan. B.M. 6959.—A handsome annual, suitable for growing in masses and useful for cut blooms.

2. **supérba,** Regel. A hardy annual resembling *S. Suworowi*, but with the spikes densely crowded into a pyramidal panicle. Asia.—According to Wm. Falconer in G.F. 1:283, this species is not as handsome nor as vigorous as *S. Suworowi*. Var. **flore-albo,** Benary, is also offered.

3. **sinuàta,** Linn. A biennial plant which may be treated as an annual, about 1 ft. high, of a spreading growth: lvs. lyrate-pinnatifid, the lobes round, the terminal bearing a bristle: scapes several, 3–5-winged, the wings produced into linear leaf-like appendages: branches several, 3-winged: floral branchlets or peduncles broadly 3-winged, the wings dilated below the spikelet and prolonged into 3 unequal triangular, acute appendages: spikelets 3–4-fld.: corolla white; calyx large, blue. Late summer. Mediterranean region of Europe. B.M. 71.

4. **macrophýlla,** Brouss. (*S. Hòlfordi*, Hort., is a garden form of this species). A tender, somewhat shrubby species 3–4 ft. high: stem branched and bearing clusters of large, sessile, ovate-spatulate lvs.: scape leafless, much branched into a large, paniculate corymb: branches winged: spikelets 2-fld.: calyx blue; corolla white. B.M. 4125. B.R. 31:7.—Cult. in S. Calif. Makes a good pot-plant for winter flowering in a cool greenhouse. T. D. Hatfield, in G.F. 9:496, says: "Old plants are somewhat subject to stem-rot. Plants should be grown in rather undersized pots, in a light soil with which some charcoal has been incorporated, and given perfect drainage, as excessive moisture at the roots is fatal. Propagation is effected by cuttings of the side shoots placed in a cool propagating bed, or better by layering, which is well accomplished in summer by making a notch in each of the side branches and then burying the plant in ordinary garden soil below the incisions." From the Canaries.

5. **speciòsa,** Linn. A hardy perennial, about 1 ft. high: lvs. obovate, attenuate on the petiole, stiffly and shortly mucronate tipped, often purplish underneath: scape somewhat angled: branches angled and winged, recurved, not crowded, bearing unilateral, scorpioidly capitate, densely imbricate short spikes: calyx persistent, crowned with a silvery white funnel-shaped border; corolla purple, very deciduous. Midsummer. Siberia. B.M. 656.

6. **Tatárica,** Linn. (*S. incàna*, var. *hybrida*, Hort. *S. Besseriàna*, Schult.). A hardy perennial, 1–2 ft. high: lvs. tufted, obovate to oblong-spatulate, 4–6 in. long, narrowed into the petiole: scape widely branched: branches triangular, slender, narrowly 3-winged, somewhat recurved: spikelets 1–2-fld., in usually lax, simple or branched spikes: fls. 2 lines long, typically red, with several garden varieties. Caucasus. B.M. 6537.—Var. **nàna,** Hort. (*S. incana*, var. *nana*), is a dwarf form.

7. **Bonduéllii,** Lestib. Fig. 2394. A tender annual or biennial plant, about 18 in. high: lvs. radical, spatulate, sinuately lyrate, hairy, subulate-pointed at the apex; lobes rounded, the terminal larger: scapes several from the same root, terete: branches angled, dichotomously cymose; ultimate branchlets obpyramidal, 3-winged, forked at the apex: fls. yellow, individually large for the genus, clustered in the fork of the branchlets or peduncles: bracts scarious, the inner furnished with sharp spines. Summer. Algeria. R.H. 1885:276. B.M. 5158. F.S. 20:2129.

8. **austràlis,** Spreng. (*S. Fórtuni*, Lindl.). A hardy perennial, about 1 ft. high: lvs. oblong or somewhat spatulate, in a rosette: scape rigid, paniculate: branches angular, brachiate, glabrous: spikelets 4–5-fld., in dense, short, one-sided spikes: fls. yellow, small. Late summer. China. B.R. 31:63.

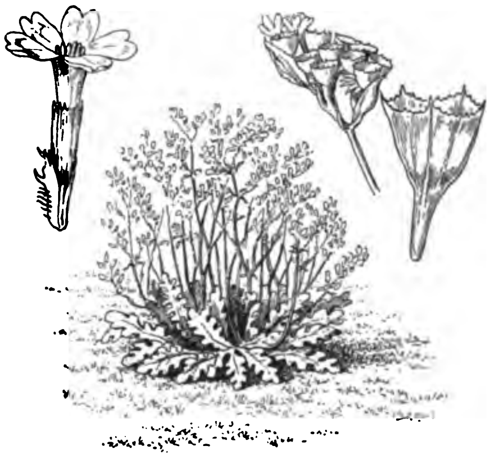
9. **Limònium,** Linn. (*S. maritima*, Lam., in part). A hardy perennial, about 1 ft. high: lvs. ovate to oblong, entire, 2–6 in. long, attenuate on the long petiole: scape nearly terete, repeatedly forked, forming a corymbose panicle: spikelets 1–3-fld., in short, dense, 1-sided spikes: fls. bluish purple. Seacoast of Europe, N. Africa, etc.—*S. maritima*, Mill., is *Armeria maritima*.

10. **Gmélini,** Willd. A hardy perennial 1–2 ft. high: lvs. glabrous, broadly ovate or obovate, very shortly petioled or sessile: scape terete below, angled above, densely corymbose-paniculate: spikelets usually 2-fld., in dense, imbricated scorpioid spikes: fls. blue. Late summer. E. Eu. and Asiatic Russia.

11. **collina,** Griseb. (*S. Besseriàna*, Frivald). A glaucous perennial with oblong-lanceolate to lanceolate lvs. sharply awned, attenuate on the petiole: scape corymbosely paniculate from near the base, the branches triangular, wide-spreading: spikelets 1-fld., in dense, short, numerous fascicle-like spikes: fls. rose. Southeastern Europe and Asia Minor.

12. **eximia,** Schrenk. A hardy perennial 1–2 ft. high: lvs. obovate or oblong, attenuate on the petiole, mucronate tipped, margins whitish: scape erect: branches not further divided, terete, pubescent: spikes ovate, crowded, somewhat unilateral: spikelets 4-fld.: calyx green; corolla lilac-rose. August. Songoria. B.R. 33:2.

13. **elàta,** Fisch. A hardy perennial about 2 ft. high: lvs. large, obovate, very obtuse, usually recurved at apex and mucronate, long-attenuate on the petiole: scapes much branched above: branches spreading, recurved, hairy triangular: spikelets 2-fld., in ovate, loosely imbricated spikes: fls. blue. July, Aug. Southern Russia.



2394. Statice Bonduelli.
The flowers are about one-third inch across.

14. **latifòlia,** Sm. A hardy deep-rooting perennial about 2 ft. high: lvs. large, oblong-elliptical, obtuse, attenuate on the petiole: scape very much branched: branches terete or angled: panicle large, spreading: spikelets 1-fld., rarely 2-fld., in lax, narrow spikes: fls. blue. Midsummer. Russia.—A handsome plant. Should be given a very deep soil in a sunny position and left undisturbed.

S. Armèria, Linn., is Armeria maritima.—*S. grandiflòra*, Hort.=Armeria latifolia.—*S. purpùrea*, Koch=Armeria elongata.—*S. Pseudo-armeria*, Pax.=Armeria latifolia.—*S. undulàta*, Bory & Chaub.=Armeria argyrocephala.

F. W. Barclay.

STATISTICS concerning horticulture are very imperfect, widely scattered and not always available. The United States Department of Agriculture has published statistics of horticulture in various publications. The Synoptical Index of the Reports of the Statistician, 1863 to 1894, is a document of 258 pages published in 1897. The Section of Foreign Markets has issued many statistical pamphlets of great interest to importers and exporters of horticultural products. Market-gardening, floriculture, seed raising, the nursery business, and viticulture were subjects of special reports in the Eleventh Census, 1890. In this Cyclopedia statistics appear under such large topics as Horticulture, Cut-flowers, Floriculture, and the various articles on states.

2395. Stauntonia hexaphylla (× ⅓).

STAUNTÒNIA (G. L. Staunton, physician, 1740–1801). *Berberidàceæ.* A genus of 2 species of tender evergreen woody vines, one from China and one from Japan. The lvs. have 3–7 digitate leaflets. Fls. monœcious, in axillary, few-fld. racemes; sepals 6, petaloid; petals wanting: sterile fl. with 6 monodelphous stamens, anthers birimose, ovary rudimentary: fertile fl. with 6 sterile stamens and 3 carpels.

hexaphýlla, Decne. Fig. 2395. A handsome vine becoming 40 ft. high: lfts. oval, about 2 in. long, stalked: fls. in axillary clusters, white, fragrant in spring: berry about 4 in. long, splashed with scarlet. Japan. A.G. 12:139.

F. W. BARCLAY.

The Stauntonias are beautiful evergreen climbers and well adapted to the soil and climate of the South Atlantic and Gulf region. Both *S. hexaphylla* and the related *Holbœllia latifolia* (known also as *Stauntonia latifolia*) grow well in the writer's Florida garden, although they are not such very luxuriant climbers as are the Allamandas, Thunbergias and Bignonias. It requires a few years before they are fully established. They are excellent subjects to be planted on old stumps and on small trees, such as catalpa and mulberry trees, which they perfectly cover in the course of time with their pretty evergreen leaves and their rather insignificant but powerfully fragrant flowers. They will not flourish in dry, hot, sandy soil, demanding for their welfare rather moist, shady spots containing a profusion of humus. A little commercial fertilizer containing a fair amount of nitrogen and potash will also prove very beneficial. The need of some kind of a stimulant is shown by the plant itself, which assumes a rather yellowish cast in the green color of the foliage. A few days after it has received some plant-food the foliage shows a very beautiful dark green color. These two species and the beautiful *Kadsura Japonica* are valuable additions to the garden flora of our southern states.

H. NEHRLING

ST. BERNARD'S LILY. *Anthericum Liliago.*

ST. BRUNO'S LILY. *Paradisea Liliastrum.*

STEIRONÈMA (Greek, *sterile threads;* referring to staminodia). *Primulàceæ.* LOOSESTRIFE. Herbs, all erect, with opposite entire leaves and rather large yellow axillary and leafy-corymbed flowers: corolla rotate, 5-parted; stamens 5, opposite the lobes, with 5 alternating subulate staminodia: capsule 1-loculed: seeds many on a central placenta. Differs from Lysimachia in the presence of the sterile stamens, and in the estivation of the corolla. Useful showy plants for borders in damp soil. All perennials.

ciliàtum, Raf. (*Lysimàchia cilidta*, Linn.). Stem 1–4 ft. high, sparingly branched, nearly glabrous: lvs. 2–6 in. long, ovate-oblong to ovate-lanceolate, ciliate, acute or acuminate, base rounded; petioles ⅛ in. long, ciliate: fls. on slender peduncles, showy, 6–12 lines broad; corolla-lobes rounded erose, often mucronate: capsule longer than the calyx. Moist thickets. U. S.

longifòlium, Gray (*Lysimàchia quadriflòra*, Sims. *L. longifòlia*, Pursh). Erect, strict and glabrous: stem 4-angled, 1–2 ft. high: lvs. linear, thick and firm, 1-nerved, acute at both ends, 1–4 in. long, smaller ones clustered in the axils, margins slightly revolute, basal broader and petioled: peduncles slender, ½–1⅛ in. long: fls. numerous, often appearing clustered; corolla 8–12 lines broad, the lobes oval, cuspidate, often erose. Eastern U. S. June, July. B.M. 660 (as *L. quadriflora*).—Very showy when in flower. Offered by collectors of native plants.

K. M. WIEGAND.

STELLÀRIA (Latin, *star;* referring to the form of the flower). *Caryophyllàceæ.* A genus of about 70 species of annual or perennial herbs, mostly diffuse, tufted or weakly ascending. They are scattered about the whole world, but are mainly found in the temperate regions. Lvs. opposite, simple: fls. usually white and disposed in terminal or rarely axillary leafy or naked paniculate cymes: sepals usually 5; petals usually 5, rarely none, bifid, often deeply; stamens 3–10; styles 3–4, rarely 5: capsule ovoid to oblong, relatively short, dehiscent by as many or twice as many teeth as there are carpels. See Gray, Syn. Flora of N. Amer.

A. *Fls. 7–10 lines across.*

Holostèa, Linn. EASTER BELL. A hardy perennial, erect, 6–18 in. high, simple or somewhat branched, from a creeping rootstock: lvs. sessile, lanceolate, 1–3 in. long: fls. white, abundant, in a terminal leafy panicle; sepals one-half or two-thirds as long as the petals. May, June. Eu., Asia. B. B. 2:22.—This and the next are desirable for dry banks where grass will not grow well and for other carpeting purposes.

AA. *Fls. 2–5 lines across.*

B. *Lvs. narrow.*

gramínea, Linn. A slender-stemmed, hardy perennial plant not usually over 6 in. high, from a creeping rootstock: lvs. sessile, linear lanceolate, usually about 1 in. long: fls. white, in terminal or lateral scarious bracted open panicles; sepals and petals nearly equal in length. May, June. Europe; naturalized in America. B. B. 2:23.—Var. **aùrea**, Hort., GOLDEN STITCHWORT, has pale yellow leaves and is lower and more matted in growth. Well adapted for sandy banks where grass does not grow well.

2396. Stellaria media (fl. × 3).

One of the commonest of chickweeds, blooming nearly every month in the year.

BB. *Lvs. ovate.*

mèdia, Linn. CHICKWEED. Fig. 2396. A low, decumbent annual weed common in all rich, moist, cultivated soils, especially troublesome during the cooler months of the growing season and in frames, etc., during winter. Lvs. 2 lines to 1⅛ in. long, the lower petioled, the upper sessile: fls. axillary or in terminal leafy cymes; sepals longer than the petals. Eu., Asia. B.B. 2:21.—It is considered to be a good fall and winter cover-plant in orchards and vineyards, but is never cultivated. It is an indication of good soil. F. W. Barclay.

STENÁCTIS. See *Erigeron*.

STENÁNDRIUM (Greek, *narrow anthers*). *Acanthàceæ*. About 25 species of tropical or subtropical American herbs, with or without short stems, and usually variegated leaves which are radical or crowded at the base of the plant. Fls. usually small, solitary in the axils of bracts on a scape-like peduncled spike, which is either dense and has broad imbricated bracts or is interrupted and has smaller bracts; calyx 5-parted; corolla-tube slender, enlarged at the top, 5-lobed; stamens 4; anthers 1-celled; style shortly 2-lobed: capsule 4-seeded, or by abortion fewer-seeded.

Lindeni, N. E. Br. A low-growing, compact plant, with broadly elliptical lvs. rounded at the apex and long-attenuate on the petiole, velvety in appearance, of a dark green with a feathering of white or yellow along the veins, somewhat purplish underneath: fls. not showy, about ¾ in. long, yellow: bracts ovate, acute, serrate, green: spikes 2–3 in. long, narrowly cylindrical. I.H. 38:136; 40:173 (4).—Tender foliage plant offered 1893–1895 by John Saul and Pitcher & Manda.

F. W. Barclay.

STENÁNTHIUM (Greek, *narrow flower;* referring to perianth-segments). *Liliàceæ*. *Stenanthium occidentale* is a rare, hardy, summer-blooming bulb from the Pacific coast, with nodding, greenish purple, 6-lobed, bell-shaped fls. about ⅛ across, borne in a slender panicle. Generic characters: fls. polygamous; perianth narrowly or broadly bell-shaped, persistent; segments connate at the base into a very short tube, narrow or lanceolate, 3–7-nerved: seeds 4 in each locule. About 5 species; one native to the island of Sachaline, another Mexican, the rest west American.

occidentàle, Gray. Stem slender, 1–2 ft. high: lvs. linear to oblanceolate: raceme simple or branched at base: bracts shorter than pedicels. Oregon to British Columbia. W. M.

STENOCÁRPUS (Greek, *narrow fruit;* referring to the follicles, which are long and narrow). *Proteàceæ*. About 14 species, of which 11 are New Caledonian and 3 are endemic to Australia. Trees with alternate or scattered lvs. entire or with a few deep lobes and red or yellow flowers in pedunculate, terminal or axillary, sometimes clustered umbels: perianth somewhat irregular, the tube open along the lower side, the limb nearly globular; anthers broad, sessile: ovary stipitate, with a long, tapering style dilated at the top; seed winged at the base.

salignus, R. Br. A medium-sized tree, with willow-like, ovate-lanceolate lvs. 2–4 in. long, with short petioles: fls. usually less than ⅛ in. long, greenish white, in umbels of 10–20 fls.: peduncles shorter than the lvs. B.R. 6:441.—Cult. in Calif. F. W. Barclay.

STENOLÒMA (Greek, *narrow-fringed*). *Polypodiàceæ*. A genus of ferns formerly included with Davallia; characterized by the decompound lvs. with cuneate ultimate segments, and the compressed suborbicular or cup-shaped indusium which is attached at its sides and open only at the top. For culture, see *Fern*.

tenuifòlia, Fee. Lvs. 12–18 in. long, 6–9 in. wide, quadripinnatifid, on polished dark brown stalks which rise from stout creeping fibrillose rootstocks; ultimate divisions with toothed cuneate lobes; sori terminal, usually solitary. Tropical Asia and Aus-Polynesia.—Var. **stricta,** Hort., has a more upright habit and narrower leaves. L. M. Underwood.

STENOMÉSSON (Greek, *small* and *middle;* alluding to the corolla-tube, which is usually contracted near the middle). *Amaryllidàceæ*. About 19 species of tropical American bulbous herbs, with linear to broadly strap-shaped leaves and red, reddish yellow or yellow flowers, in a usually many-flowered umbel: perianth-tube long, erect or recurved, the lobes short, erect or spreading: filaments straight, connected by a membrane: capsule somewhat globose, 3-furrowed, 3-loculed: seeds black.

Stenomessons require a good soil and a sunny house with a temperature never below 45°. During the growing season they should have plenty of water, but when at rest comparative dryness is necessary. The offsets should be removed from the old bulbs before growth commences. The plants continue in bloom a number of weeks.

A. *Style shorter than the perianth.*

incarnàtum, Baker (*Cobúrgia incarnàta*, Sw.). A tender plant: bulb ovate, 2–3 in. through: lvs. thick, glaucous, obtuse, about 1⅛ ft. long, strap-shaped: scape 2 ft. high: fls. 4–5 in. long, few to many in an umbel, variable in color but typically crimson, with a green spot on each segment. August. Peru. I.H. 38:123 (perianth-limb light yellow). Gn. 50:1076.

AA. *Style longer than the perianth.*

flàvum, Herb. A tender plant: bulb somewhat globose, 1 in. through: lvs. about 1 ft. long, obscurely petioled, at first compressed on the margin: scape 1 ft. high: fls. yellow, about 2 in. long, usually few in an umbel. B.M. 2641. B.R. 10:778 (as *Chrysiphiala flava*).

F. W. Barclay.

STENOTÁPHRUM (Greek, *stenos*, narrow, and *taphros*, a trench; the spikelets being partially embedded in the rachis). *Gramineæ*. About 3 species of tropical regions, one of which is found along the Gulf coast, especially in Florida, where it is utilized as a lawn grass. In this respect it is similar to Bermuda grass, being naturally adapted to a sandy soil, which it binds by its rhizomes and creeping habit as does that grass. Spikelets 2-fld., the lower staminate or neutral 2–4 in a short spike, which is embedded in the alternate notches of the broad rachis, thus forming a spike-like panicle. Creeping grasses with compressed culms and flat, divergent leaves.

Americànum, Schrank. (*S. secundàtum*, Kuntze. *S. glàbrum*, Trin.). St. Augustine Grass. Flowering branches erect, 6–12 in. high. Var. **variegàtum** has leaves striped with white, and is used as a basket plant. A. S. Hitchcock.

The introduced form of St. Augustine Grass is one of the most valuable lawn grasses for the extreme South. It will grow on almost any soil and thrives even in shade. The leaves are rather broad, never over 6 in. high and require little mowing. This grass does not become coarse, does not hold dew or rain, and is particularly good for house lots and lawns. It does not need as much water as Bermuda or St. Lucie grass. It is mostly propagated by cuttings.

E. N. Reasoner.

STEPHANÁNDRA (Greek, *stephanos*, crown, and *aner, andros*, male stamen; alluding to the persistent crown of stamens). *Rosàceæ*. Ornamental small deciduous shrubs with alternate, stipulate, lobed lvs. and with small white fls. in terminal panicles. Graceful plants, with handsome foliage, hardy north or almost so. Well adapted for borders of shrubberies or rocky banks on account of their graceful habit and handsome foliage. Prop. easily by greenwood cuttings under glass and by seeds; probably also by hardwood cuttings.

Four species in China and Japan, all undershrubs with slender more or less zigzag branches: fls. slender-pediceled, small, with cup-shaped calyx-tube; sepals and petals 5; stamens 10–20: carpel 1; pod with 1 or 2 shining seeds, dehiscent only at the base. Closely allied to Neillia and distinguished chiefly by the cup-shaped calyx-tube and the incompletely dehiscent 1–2-seeded pod.

flexuòsa, Sieb. & Zucc. (*S. incisa*, Zabel). Shrub, 3 ft. high, almost glabrous, with angular spreading distinctly zigzag branches: lvs. triangular-ovate, cordate or truncate at the base, long-acuminate, incisely lobed and serrate, the lower incisions often almost to the midrib, pubescent only on the veins beneath and grayish green, ¾–1⅓ in. long: fls. white, about ⅛ in. across, in terminal short, 8–12-fld., usually panicled racemes; stamens 10. June. Japan, Korea. Gn. 55, p. 141.

Tanákæ, Franch. & Sar. Fig. 2397. Shrub, 5 ft. high, almost glabrous: lvs. triangular-ovate, slightly cordate at the base, abruptly and long-acuminate, usually 3-lobed and doubly serrate or lobulate, pubescent only on the veins beneath, 1½–3 in. long: fls. in terminal loose panicles, slender-pediceled, ⅙ in. across; stamens 15–20. June, July. Japan. B. M. 7593. Gt. 45:1431.—Handsome shrub much resembling Neillia in foliage, coloring in fall brilliant orange and scarlet or yellow.

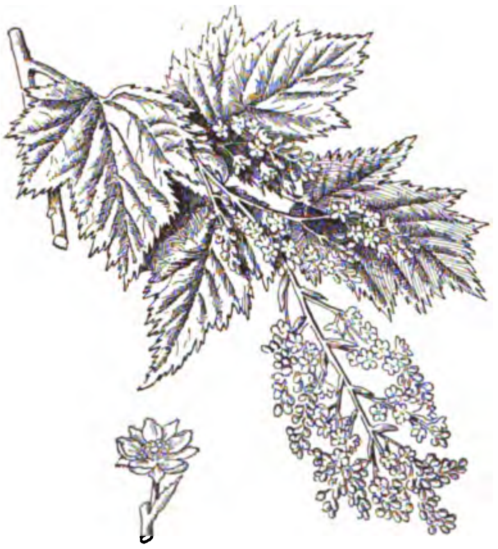
ALFRED REHDER.

Stephanandra flexuosa is closely allied to Spiræa and has the Spiræa style of beauty. It grows 2–3 ft. high and has long, slender branches which are densely and regularly interwoven in a fan-like manner. Its habit of growth is fountain-like, the branches being gracefully pendent. Its flowers are snowy white and, although minute, are so numerous that the plant becomes very showy. It is especially fitted for the back of herbaceous borders or for the front of larger shrubs. Its foliage, which is deeply toothed, is tinted red in early spring and deep glossy green during spring and summer. In the autumn it puts on unusual tints of reddish purple. This species can be increased by cuttings, but it is usually propagated by layers, which root readily and are easily transplanted. The foliage becomes so dense that the growth of weeds beneath its thickly set branches is effectually prevented.

J. W. ADAMS.

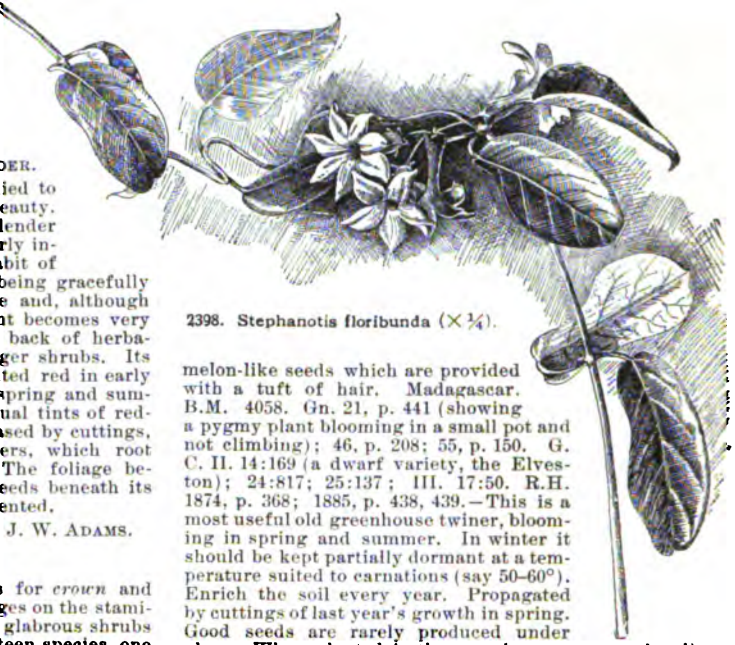
STEPHANOPHÝSUM. See *Ruellia*.

STEPHANÒTIS (from Greek words for *crown* and *ear;* alluding to the 5 ear-like appendages on the staminal crown). *Asclepiadàceæ*. Twining glabrous shrubs of the Old World tropics, of about fourteen species, one of which, *S. floribunda*, is one of the best of greenhouse climbers. Lvs. opposite and coriaceous: fls. large and showy, white, in umbel-like cymes from the axils; calyx 5-parted; corolla funnelform or salverform, the tube cylindrical and usually enlarged at the base and sometimes at the throat, the lobes 5: crown mostly of 5 scales that are usually free at the apex and adnate to the anthers on the back, the anthers with an inflexed tip or membrane: fr. a more or less fleshy follicle.



2397. Stephanandra Tanakæ (× ½).

floribúnda, Brongn. Fig. 2398. Glabrous, 8–15 ft.: lvs. elliptic, with a short point, thick and shining green, entire: fls. 1–2 in. long, of waxy consistency, white or cream color, very fragrant, in many umbels, the calyx one-fourth or less the length of the corolla-tube: fr. 3–4 in. long, ellipsoid, glabrous, fleshy, containing melon-like seeds which are provided with a tuft of hair. Madagascar. B.M. 4058. Gn. 21, p. 441 (showing a pygmy plant blooming in a small pot and not climbing); 46, p. 208; 55, p. 150. G. C. II. 14:169 (a dwarf variety, the Elveston); 24:817; 25:137; III. 17:50. R.H. 1874, p. 368; 1885, p. 438, 439.—This is a most useful old greenhouse twiner, blooming in spring and summer. In winter it should be kept partially dormant at a temperature suited to carnations (say 50–60°). Enrich the soil every year. Propagated by cuttings of last year's growth in spring. Good seeds are rarely produced under glass. When planted in the open in warm countries, it thrives best in partial shade. Very liable to mealy bug.



2398. Stephanotis floribunda (× ¼).

S. Thoudrsii, Brongn., from Madagascar, appears to be the only other species in cult., but it is not in the American trade. It has obovate lvs., fls. in 3's, and sepals about one-third the length of the corolla-tube.

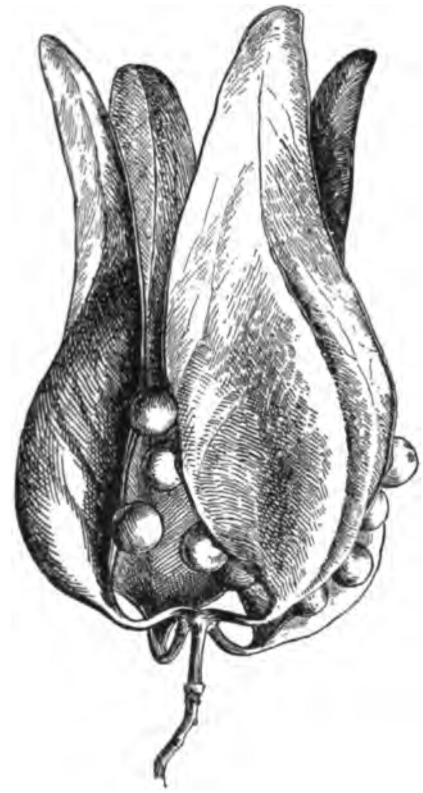
L. H. B.

Stephanotis floribunda is one of the handsomest of our warmhouse climbers, blooming in spring and summer. In the days when short blooms were used in bouquets it was one of the most valuable flowers that the florist had, its large waxy umbels having a delicious odor. It should be kept about 60° during the winter, with less water. In the summer it delights in the temperature of our warmest houses with plenty of syringing. When given too much root room it grows very rampant and is less inclined to flower. Therefore a tub or a border where its roots are restricted is better, with an annual top-dressing of good manure. Its greatest enemy is the mealy bug, which, if allowed to get a lodgment on the plant, is a great pest. Seed pods are occasionally seen on the plant, but it is easily propagated by cuttings from pieces of the last year's growth and they strike freely in sand. This is also one of the most valuable plants for private establishments. When grown in a 12- or 15-inch pot or tub and trained on a balloon trellis it makes splendid specimens and is often seen at our horticultural exhibitions; and when in bloom there is nothing finer for the conservatory.

WM. SCOTT.

STERCÙLIA (*Sterculius* of Roman mythology, from *stercus*, manure; applied to these plants because of the odor of the leaves and fruits of some species). *Sterculiàceæ*. Some 50 or 60 species of tropical trees or shrubs, most abundant in Asia, a few of which are planted in the southern states and California. Fls. mostly polygamous, apetalous, the calyx tubular, 4–5-cleft, often colored; stamens united in a column which bears a head of 10–15 sessile anthers; pistil of as many carpels as calyx-lobes and opposite them, each carpel 2- to many-ovuled, the stigmas free and radiating: fr.

follicular, each carpel distinct and either woody or membranaceous and sometimes opening and spreading into a leaf-like body long before maturity (Fig. 2399); seeds 1-many, sometimes arillate or winged, sometimes hairy. Sterculias have very various foliage, the leaves of different species being simple, palmately lobed or digitate. The flowers are mostly in panicles or large clusters, sometimes large and showy, varying from greenish to dull red and scarlet. The species are grown mostly for street and lawn trees. The only kinds that are generally known in this country are *S. platanifolia*, *S. diversifolia* and *S. acerifolia*, the last two known in California as Brachychitons. All are easily grown from seeds. Sterculiaceous plants are allied to the Malvaceæ.



2399. Mature follicles or fruits of Sterculia platanifolia, bearing seeds on the margins. Natural size.

A. *Carpels expanding before maturity into leaf-like bodies, exposing the seeds.*

platanifòlia, Linn. f. (*Firmiàna platanifòlia*, Schott & Endl.). JAPANESE VARNISH TREE. CHINESE PARASOL TREE. Fig. 2399. Strong-growing, smooth-barked, round-headed tree of medium size, with deciduous foliage: lvs. very large, glabrous, cordate-orbicular, palmately 3-5-lobed like maple lvs., the lobes sharp-pointed: fls. small, greenish, with reflexed calyx-lobes, in terminal panicles: carpels 4 or 5, bearing globular pea-like seeds.—Said to be native of China and Japan. Hemsley admits it to the "Flora of China," and Sargent says in "Forest Flora of Japan" that it is one of the several Chinese or Corean trees grown in Japan. Bentham, in "Flora Hongkongensis," says that it is native to China. Franchet and Savatier, in "Enumeratio Plantarum Japonicarum," admit it as an indigenous Japanese species. Now a frequent tree from Georgia south. Excellent for lawns and shade.

AA. *Carpels not becoming leaf-like.*

B. *Lvs. all digitately compound.*

fœ̀tida, Linn. Tall, handsome tree, with all parts glabrous except the young foliage: lvs. crowded at the ends of the branchlets, of 5-11 elliptic, oblong or lanceolate, entire, pointed, thick leaflets: fls. large, dull red, in simple or branched racemes, appearing with the lvs.: fr. large and woody follicles, glabrous outside, often 3 in. or more in diam. and containing black seeds the size of a hazelnut. Tropical Africa and Asia to Australia.—Grown in southern Florida. In its native countries, the seeds are said to be roasted and eaten.

BB. *Lvs. entire or only lobed (compound forms sometimes borne on S. diversifolia).*

C. *Follicles pubescent outside and corky inside.*

alàta, Roxbr. Large tree, the young parts yellow-pubescent, the bark ash-colored: lvs. large, cordate-ovate, acute, 7-nerved: fls. about 1 in. across, in few-fld. panicles shorter than the lvs., and which arise from the leafless axils, the calyx tomentose and the segments linear-lanceolate: follicles 5 in. in diam., globose, with wide-winged seeds. India.—Introd. into S. Florida.

CC. *Follicles glabrous on the outside, usually villous within.*

acerifòlia, A. Cunn. (*Brachychìton acerifòlium*, F. Muell.). BRACHYCHITON. FLAME TREE. Evergreen tree, reaching a height of 60 ft., glabrous: lvs. long-petioled, large, deeply 5-7-lobed, the lobes oblong-lanceolate to rhomboid, glabrous and shining: fls. brilliant scarlet, the calyx about ¾ in. long, in large, showy trusses: follicles large, glabrous, long-stalked. Australia.—A most showy tree when in bloom, and planted on streets and lawns in California. Thrives in either dry or fairly moist places.

diversifòlia, G. Don (*Brachychìton popùlneum*, R.Br.). BRACHYCHITON. Tall tree, glabrous except the fls.: lvs. very various, mostly ovate to ovate-lanceolate in outline, often entire, sometimes variously 3-5-lobed on the same tree, all parts acuminate: fls. tomentose when young, bell-shaped, greenish red and white or yellowish white, in axillary panicles: follicles 1½-3 in. long, ovoid, glabrous, stalked. Australia.—Planted in California, and commoner than the last.

Var. **occidentàlis**, Benth. (*Brachychìton Grègorii*, F. Muell. *S. Grègorii*, Hort.). Lvs. deeply 3-lobed, the lobes narrow, sometimes with short lateral ones: fls. salmon-color; calyx smaller and more tomentose. West Australia.—Offered in S. California.

L. H. B.

STEREOSPÉRMUM (Greek; *hard seed*). *Bignoniàceæ.* About 10 species of tropical trees native to Asia and Africa, of which 2 are cult. n S. Fla. and S. Calif. They have handsome foliage, which is once or twice pinnate, and large bignonia-like flowers of pale yellow or pale rose, borne in large, lax, terminal panicles; calyx ovoid, open or closed in the bud; corolla-lobes 5, nearly equal, round, crisped, toothed or laciniate: capsule long, terete, loculicidally 2-valved; seeds in 1 or 2 series.

Stereospermum Sinicum seems to revel in the light sandy soil of the Florida gardens. Its abundant, large, fern-like, crimped bipinnate foliage and its luxuriant symmetrical growth combine to make it an object of great beauty. It grows to a height of 10 to 12 ft. in one season, and if not cut down by a severe freeze it attains a height of 20 ft. in two years, provided the soil is made rich by a good fertilizer. Planted out in a conservatory in the North it soon reaches stately dimensions. It is easily raised from cuttings placed in sand. *S. suaveolens* lacks the elegance of its congener, and it does not sprout as readily after it has been frozen down.

A. *Foliage twice-pinnate: fls. pale yellow.*

Sínicum, Hance. Tree, said to attain 60 ft.: lvs. opposite, bipinnate; pinnæ about 4 pairs, each pinna with about 7 lfts.; lfts. ovate-lanceolate, 2 x ¾ in.: corolla pale sulfur, 3 in. long; lobes 1 in. long, somewhat crisped. Hong Kong.

AA. *Foliage once-pinnate: fls. pale or dark purple.*

suavèolens, DC. Tree, 30-60 ft. high: lvs. 12-18 in. long: lfts. 7-9, broadly elliptic, acuminate or acute, 5½ x 3 in.: panicle many-fld., viscous, hairy: fls. 1¼ in. long; lobes crisped-crenate. India.

H. NEHRLING and W. M.

STERNBÉRGIA (after Count Caspar Sternberg, a botanist and writer, 1761–1838). *Amaryllidàceæ.* A genus of 4 species of low-growing hardy bulbous herbs from eastern Europe to Asia Minor, with strap-shaped or linear leaves and bright yellow crocus-like flowers. Perianth regular, erect, funnelform; stamens inserted on the perianth-tube; filaments long, filiform; anthers dorsifixed, versatile: fr. fleshy, scarcely dehiscent; seeds subglobose. The bulbs should be planted rather deeply, about 6 inches. J. N. Gerard says of their culture in G.F. 10:158 that they require a rather heavy soil, in a somewhat dry, sunny position where they will be well ripened in summer.

2400. Sternbergia lutea (× ⅙).

A. *Fls. and lvs. appearing together.*

B. *Blooming in fall.*

lùtea, Ker-Gawl (*Amarýllis lùtea,* Linn.). Fig. 2400. Bulb about 1½ in. through: lvs. 6–8 to a bulb, strap-shaped, becoming 1 ft. long: fls. yellow, 1–4 to a bulb; tube less than ½ in. long; perianth-segments about 1½ in. long. Mediterranean region of Eu. and Asia. B.M. 290. Gn. 44, p. 365; 47, p. 114. G.C. II. 13:21.

BB. *Blooming in spring.*

Fischeriàna, Roem. Has the habit of *S. lutea,* but differs in season of bloom and stipitate ovary and capsule. Wm. Watson says (G.F. 8:144) that the fls. are a brighter yellow and as large as the largest forms of *S. lutea.* Caucasus. B.M. 7441.

AA. *Fls. and lvs. appearing at different seasons.*

B. *Lvs. linear: fls. small.*

colchiciflòra, Waldst. and Kit. Bulb about ½ in. through: lvs. appearing in spring, 3–4 in. long: fls. yellow, in fall; segments about 1 in. long by 2 lines broad. East Europe, Asia Minor. B.R. 23:2008.

BB. *Lvs. strap-shaped: fls. large.*

macrántha, J. Gay. Bulb globose, 1½ in. through, with a long neck: lvs. becoming 1 ft. long, nearly 1 in. wide, fully developed in June: fls. bright yellow, 3–5 in. across; segments about 1 in. broad. October. Asia Minor. G.C. III. 23:97. Gn. 47:1001. B.M. 7459.—A handsome species.

F. W. Barclay.

STEVENSÒNIA (named after one of the governors of Mauritius). *Palmàceæ.* A monotypic genus of tropical palms from the Seychelles. Tall trees, spiny throughout or at length nearly smooth, with ringed caudex: lvs. terminal, spreading-recurved, the cuneate-obovate blade convex, bifid, oblique at the base, plicate-nerved, the margins split, segments deeply cut, the mid-nerves and nerves prominent, scaly beneath; petiole plano-convex; sheath deeply split, scaly, spined; spadix erect; peduncle long, compressed at the base: branches thickish: spathes 2, the lower one persistent, prickly, the upper one smooth, woody, club-shaped, deciduous: fr. ellipsoidal, small, orange-colored. For culture, see *Palm.*

grandifòlia, Duncan (*Phœnicophòrum Sechellàrum,* H. Wendl.). Caudex 40–50 ft. high, very spiny when young, less so when old; petiole 9–18 in. long, pale green; blade cuneate-obovate. Seychelles. I.H. 12:433. B.M. 7277. Gn. 23, pp. 173, 320.

Jared G. Smith.

STÈVIA. For the Stevia of florists, see *Piqueria.* True Stevias are described in horticultural literature, but it is not known that any of them are now in the American trade.

STEWÁRTIA. See *Stuartia.*

STICK-TIGHT. Vernacular for burs of *Cynoglossum.*

STIGMAPHÝLLON (Greek, *stigma* and *leaf;* referring to the leaf-like appendages of the stigmas). Sometimes written *Stigmaphyllum. Malpighiàceæ.* About 50 species of tropical American woody vines with usually opposite, entire to lobed, petioled leaves and yellow flowers in axillary, peduncled umbel-like cymes: calyx 5-parted, 8-glandular; stamens 10, of which 6 are perfect and 4 antherless or deformed; styles 3; stigmas produced into leaf-like or hooked appendages: ovary 3-loculed, 3-lobed.

ciliàtum, A. Juss. A tender woody twining vine: lvs. evergreen, smooth, opposite, cordate, ciliate: fls. bright yellow, large, in peduncled axillary clusters of 3–6. P.M. 15:77. Gn. 33:637.—Apparently the only species in the trade and possibly the most handsome of the genus. G. W. Oliver says that *S. ciliatum* is one of the best medium-sized vines for outdoor trellis work. For pot culture it is of little service and thrives in the greenhouse only when planted out. September is the best month for propagation. On outdoor plants much of the wood is useless for this purpose, being thin and soft. Choose the wood made early in the season; a heel or joint is not necessary; root in bottom heat and carry through the winter in the greenhouse as small plants. Ernest Braunton says of its culture in S. Calif. that it must have shade, protection from dry or hot winds, and an open soil. Under the right conditions it flowers admirably.

F. W. Barclay.

STILES, WILLIAM AUGUSTUS, journalist, editor and park commissioner, was born March 9, 1837, at Deckertown, Sussex county, in northern New Jersey, and died October 6, 1897, in Jersey City, N. J. His grandfather settled on a farm near Deckertown in 1819, where his father, Edward A. Stiles, in 1833 founded Mount Retirement Seminary, a successful school of the highest rank during the following thirty years. Here William A. Stiles received his early education; as a boy he showed great love for classical literature and unusual proficiency in music and mathematics. He was distinguished as a student at Yale, graduating in 1859 in a class which included many men who have since attained high rank in public affairs. Prevented from taking up the profession of law by constitutional weakness and defective eyesight, his many-sided nature found expression in diversified activities. He was in turn a teacher, assistant superintendent of public schools, surveyor on the Pacific coast, writer of political articles, secretary of the Senate of New Jersey, actuary of a life insurance company, and gauger in the New York custom house. During a long period of illness and almost total blindness he acquired systematic knowledge of plant-life from readings by his sisters, and this gave impulse toward subsequent study on broader lines. He brought together many rare and choice species of plants, and made interesting experiments on the farm. Love of nature was henceforth a dominant force with him. His articles in the daily press of New York on the various interests of country life attracted wide attention, and led to his appointment as an editorial writer of the New York *Tribune,* a relation which continued throughout his lifetime. In 1883 he became agricultural editor of the Philadelphia *Press.* Keenly interested in introducing scientific discoveries and improved methods into general practice, he established relations with the foremost agriculturists abroad and at home, and made his department a useful and valuable exponent of the best knowledge of the time. His masterly conduct of the page during the next five years set a high standard for journalism in this field, and established his reputation as a specialist in agriculture and cognate subjects. On the founding of "Garden and Forest" in 1888, William A. Stiles was invited to be the managing editor. For nearly ten years, to the close of his life, he devoted himself to this journal through vigorous editorial writing and management, and steadily maintained the high character of the most able and influential periodical in American horticultural journalism. His ripe scholarship, sound judgment, masterly use of English, and persistent energy, all contributed to the success of this part of his lifework, and his profound, sympathetic understanding of contact with nature as a human and spiritual need, characterized all his activities. For many years he rendered conspicuous service in working for the establishment of small parks easily accessible to the poor, and for the wise conduct of the larger parks and their preservation from invasion and despoilment. His special ability and influence received public recognition in 1895, when he was appointed a park commissioner of New York city, a position in which he rendered signal and valuable service until the time of his death. William A. Stiles was unmarried. He had a fund of inimitable wit and humor, and was the warm and honored friend of the best men and women in the communities in which he lived. M. B. Coulston.

STILLÍNGIA (after Dr. Benj. Stillingfleet, an English botanist). *Euphorbiàceæ.* About 15 species of herbs or shrubs from North and South America with alternate, stipulate leaves and small, monœcious, apetalous flowers in terminal spikes. The genus is closely allied to Sapium, but differs mainly in the fruit, which in Stillingia is of 2–3 dry 1-seeded carpels with no central axis remaining after dehiscence but with a large, persistent, 3-horned receptacle, while in Sapium the fruit dehisces by splitting down the back of each carpel, leaving a 3-winged central axis to which the seed is for a long time persistent: the large receptacle is also wanting in Sapium.

sylvática, Linn. Queen's Delight. A half-hardy perennial herb with a woody root: stems clustered, 2–3 ft. high: lvs. numerous, very short-petioled or sessile, linear-lanceolate to obovate, obtusely serrate: fls. yellowish, in terminal spikes. Spring to fall. Southern states. According to Mueller's "Select Extra Tropical Plants," the root is extensively used for its emetic and purgative properties. C. D. Beadle reports that the plant has stood a temperature of −9° at Biltmore, N. C. The plant grows readily from seed, but does not bear transplanting well.

For *S. sebiferum*, see Sapium sebiferum.

F. W. Barclay.

STÌPA (Greek, *stipe*, tow; in allusion to the plumose awns of one of the original species). *Gramineæ.* A large genus of about 100 species, throughout the world except the colder parts. They are particularly characteristic of the plains, savannas and steppes. The long, sharp-pointed awns of some species are troublesome or even dangerous to stock, especially sheep, on account of their tendency to work through the skin and into the vital organs. Perennial grasses with narrow involute leaves and loose panicles: spikelets 1-fld.; empty glumes membranaceous, longer than the indurated fl.-glume; fl.-glume with a sharp hairy callus below and a stout persistent twisted awn above. At maturity the fl.-glume falls away from the empty glumes. The species here mentioned are cultivated for ornament, including the making of dry bouquets.

pennàta, Linn. Feather Grass. Culms 2–3 ft., in bunches: empty glumes narrowed into awns an inch or more long: fl.-glume ⅓ in. or more long; awn a foot or more long, lower portion smooth and twisted, the upper very plumose, giving the panicle a very feathery ornamental appearance. Steppes of Europe and Siberia. Gn. 9, p. 199. V. 3:247. R.H. 1890, p. 489.

elegantissima, Labill. Stems 2–3 feet, erect from a horizontal rhizome: lvs. narrow and erect: panicle very loose, 6–8 in. long, very plumose: spikelets 4–6 lines long; awn 1¼ in. long. Thrives in sandy soil. Australia.

tenacissima, Linn. Esparto Grass. Culms 2–3 ft., in bunches: lvs. narrow, smooth, cylindrical, elongated: panicles contracted, 2-cleft: fl.-glume awned between teeth; awn 1–2 in. Spain and North Africa. The lvs. furnish fiber from which are made ropes, mats, paper, etc. In Africa it is called Halfa or Alfa.

spártea, Trin. Porcupine Grass. Culms 2–3 ft., in bunches: panicles contracted; empty glumes broad, nerved, about 1⅓ in., tapering to a slender point: fl.-glume nearly 1 in.; awn usually about 6 in. long, the lower half erect, pubescent and strongly twisted, the upper half bent to one side, rough. Illinois to California.

capillàta, Linn. Similar to *S. spartea:* flowers more numerous but smaller in every way: fl.-glume about ⅓ in. long; lower part of awn only minutely pubescent, and the upper or bent portion sinuous. Plains, Europe.

A. S. Hitchcock.

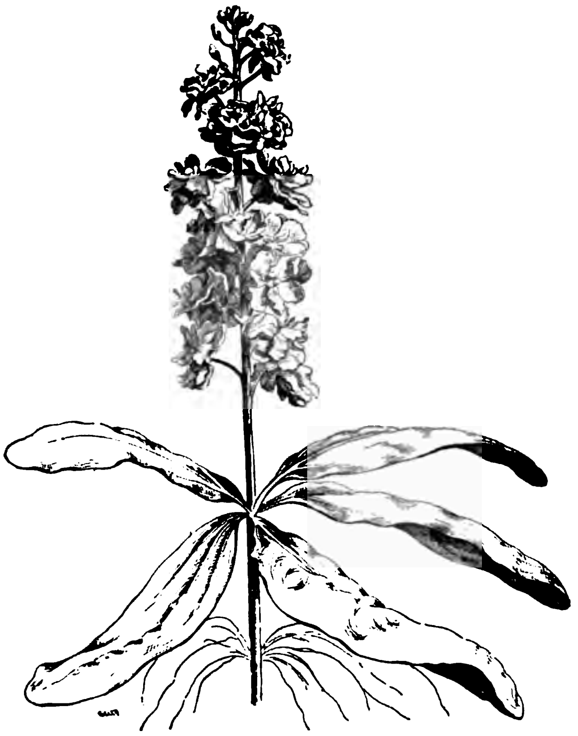
ST. JOHN'S WORT. *Hypericum.*

STOBÆA (after D. Stobæus, a Swedish patron of Linnæus). *Compósitæ.* This genus is included by Bentham and Hooker under Berkheya. About 70 species of South African herbs or somewhat shrubby plants, commonly with aspect of thistles as to the foliage. Lvs. usually decurrent, dentate, pinnatifid or pinnatisect, the lobes dentate and spiny: heads small to large, solitary or somewhat corymbose; rays usually yellow.

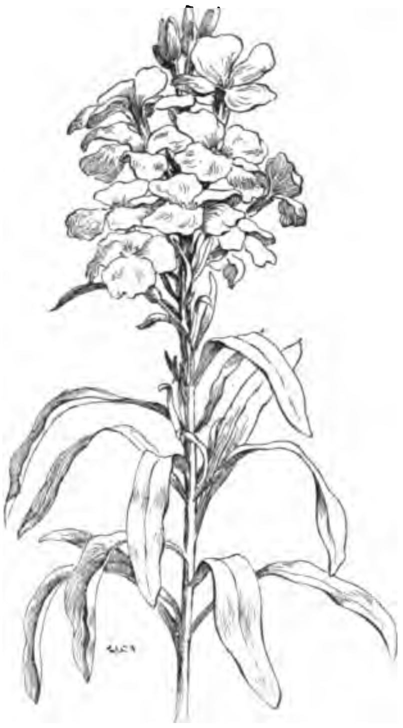
purpùrea, DC. (*Berkhèya purpùrea*, Benth. & Hook.). A half-hardy, probably biennial plant 2–3 ft. high: lower lvs. about 1 ft. long, irregularly lobed, spiny on the margins, cottony beneath, dark green above: stem-lvs. smaller, long-decurrent: fl.-heads 3 in. across, purple to white, resembling a single dahlia. G.C. 1872:1261.—To be recommended for growing with half-hardy alpines. It can be wintered in a coldframe. Prop. by seed and division. F. W. Barclay.

STOCKS (for botany, see ***Matthiola***. Fig. 2401; also compare Figs. 424, 1377 and 2402) are divided into two groups, Summer and Winter Stocks. The former are annuals and therefore bloom in the first summer; the latter are biennials and bloom in the second year, or, if sown very early, late in the fall or the winter of the first year. Fall or intermediate Stocks are between these two groups; they bloom profusely in the autumn.

The seed of the Summer Stocks, or, as they are commonly called, "Ten Weeks' Stocks," is sown from the end of February until April, mostly in a lukewarm hotbed, which must be sunny and well aired. Good clean garden soil, well mixed with sand and free of manure, is the proper soil for sowing the seed in. The seed will germinate in 6–10 days, the light-seeded sorts germinating quicker than the dark-seeded kinds. Air must be admitted as soon as the seeds have sprouted, a great deal in warm weather and less when the weather is raw, until finally the sash can be entirely removed during the day. If the seedlings need water it should be given in the morning, so that they are dry at night. If the sun is hot the seedlings must be shaded. If the seed is to be raised from pot-grown plants a good, well-matured, sandy garden soil should be used which contains an admixture of well-rotted sod or the soil taken from river bottoms. The pots are about 6 inches high, with a diameter of 7 inches. When they show their fourth leaf the seedlings are planted firmly into these pots with a dibber, pots being well filled with the above soil; care should be taken that the roots are inserted vertically. From 6 to 8 plants are put into such a pot. These pots are then placed on sunny stages, usually protected by tilt-roofs. The development of the plants depends now principally on careful watering, which is done mostly with watering pots and at the beginning with a fine spray attached to the spout of the watering pot. After a crust has formed on the top of the soil, the spray is discontinued and the pots are watered with the pipe of the can. This watering is done at night during warm weather and in the morning when the weather is cold. Very little watering is done in continuously cloudy or rainy weather. The watering of the Stocks is the most particular and important part in the cultivation in pots, for if due care is not exercised a white maggot will make its appearance while the plants are in bud and destroy the roots. The common flea-beetle



2401. Double Stock, Matthiola incana, var. annua (× ⅓).



2402. Wallflower—Cheiranthus Cheiri, for contrast with Stock, with which it is often confounded (× ½).

The flowers are yellow or copper-colored, and the leaves thinner, narrower and more acute than those of the Stock.

is another of the enemies of Stocks; this often appears in large numbers and eats the leaves of the young plants. Frequent syringing with water is the only remedy found so far against these pests when they infest Stocks.

After the plants have been in bloom for some time the double-flowering specimens are cut out and the watering is continued carefully until the seed-pods which form on the single plants show indications of ripening, which is in October. The plants are then pulled and tied in bundles, which are hung up in dry sheds until the middle or the latter part of November and December, in which time the seed fully matures in the pods. Now comes the most important part of seed-saving of Stocks. The bundles of plants are taken down, the roots and part of the stems cut off, and the stalks are taken in hand by expert gardeners, who sort them, for common seed and also for the seed stock. The pods indicate by their shape, size and form whether the seeds contained therein will produce a high percentage of double flowers the following year, and the selection is done with care. The seed that will go on the market can be vastly improved by the removal of "wild" pods, which contain seeds that produce nothing but single flowers. The seeds are removed by hand from the pods, mostly by women and children. CARL CROPP.

The double-flowered varieties of *Matthiola incana*, var. *annua*, commonly known as "Ten Weeks'" or "Summer Flowering Stocks," are among the most fragrant and pleasing of common garden annuals. They are readily raised from seed sown in a gentle hotbed about the first week in April, keeping them close for a few days until germinated, gradually inuring them to an abundance of air as they increase in size, and finally, towards the end of May, transferring them to the flower garden or border where they are intended to flower, choosing a dull or showery day for the purpose.

The varieties of *M. incana*, though perennial in their native habitat, are best treated here as annuals, and are well worth growing as pot-plants, either for cutting or the decoration of the conservatory during the winter and early spring months. They are known in the trade in this country as "Boston Florists' Stock," "Princess Alice," "Cut-and-come-again," "East Lothian" and "Brompton Stocks." Though they are as readily propagated from seed as the "Ten Weeks' Stocks," they require a much longer period of time to grow; therefore, those intended for early winter flowering should be sown in June, while those intended for spring flowering should be sown about the middle of August. Fill a number of 3-inch pots with sifted loam and plant about three seeds in each pot; place them in a close shaded frame till germinated; as soon as they commence to grow reduce the seedlings to one in each pot. They must not be allowed to suffer for water at any time or they will lose their leaves. As soon as the pots are fairly well filled with roots (though they must not become potbound), they should be shifted on into larger sizes until they reach a 6- or 7-inch pot. The soil best suited to them is a rich, heavy loam. As soon as the plants show signs of flowering they are greatly benefited by an occasional watering of weak liquid cow or sheep manure water. Those sown in June should be grown outside until the approach of cold weather, when they should be transferred to the house where they are intended to flower, while those sown in August should be grown on in coldframes until very cold weather sets in, when they should be placed in a cool-house, keeping them at a temperature of about 45°. Stocks while growing in the greenhouse are very subject to the attacks of green- and black-fly; they should, therefore, be fumigated at least once in two weeks, or should have tobacco stems placed among the pots.

Seed of both *M. annua* and *M. incana* is imported from Germany, principally Erfurt and Quedlinburg, where plants are specially grown for seed which will produce double flowers (see Gardener's Chronicle, 1866, p. 74; also Dr. M. T. Masters' Vegetable Teratology Appendix). EDWARD J. CANNING.

STOCK, TEN WEEKS'. See *Stocks* and *Matthiola incana*, var. *annua.*

STOCK, VIRGINIAN. *Malcomia maritima.*

STOKES' ASTER. See *Stokesia.*

STOKÈSIA (Jonathan Stokes, M.D., 1755–1831, English botanist). *Compósitæ.* Stokes' Aster is one of the rarest, choicest and most distinct of American hardy perennial herbs. It is a blue-fld. plant about a foot high which at first glance has points in common with China asters, centaureas and chicory. The heads are 3 or 4 in. across in cultivation. The marginal row of flowers is composed of about 15 ray-like corollas, which have a very short tube at the base and are much broadened at the apex and cut into 5 long, narrow strips.

Stokes' Aster is hardy as far north as Rochester, N. Y., and Boston, Mass. Probably many persons have been deterred from trying it because it is native only to South Carolina and Georgia, and because it is considered a greenhouse subject in some standard works on gardening. The fact that it is found wild in wet pine barrens is also deceptive, for the roots, as Woolson and Keller testify, will decay if water stands on the soil in winter. Moreover, the plant has been praised by Meehan for its drought-resisting qualities. Stokes' Aster should be planted in a well-drained, sandy loam, not in cold and heavy clay. It blooms from August until hard frost. According to Chapman, the heads of wild specimens are only an inch across, but the size of heads in cultivated plants is stated by many horticultural experts to be 3–4 in. across. J. B. Keller writes that Stokes' Aster is frequently used for cut-flowers. In the wild the heads are few in a cluster or solitary; in cultivation a good branch sometimes bears as many as 9 heads. No double form seems to have appeared.

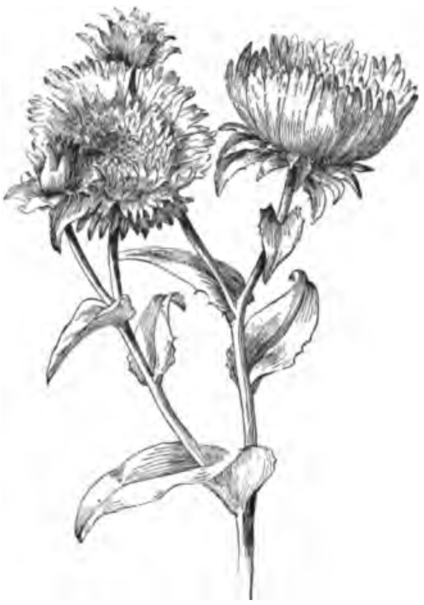
Generic characters: heads many-fld.: marginal fls. much larger, deeply 5-cut: involucre subglobose; outer bracts prolonged into a large, leafy, bristly-fringed appendage: akene 3–4-angled, smooth: pappus of 4–5 thread-like, deciduous scales.

cyànea, L'Hérit. Stokes' Aster. Fig. 2403. Much-branched, hardy perennial herb, 1–2 ft. high: branches often purplish: lvs. lanceolate; radical ones entire, tapering at the base into long, flattened stalks; cauline lvs. gradually becoming sessile, the uppermost with a few teeth near the base and half-clasping: fls. blue or purplish blue, 3–4 in. across. Aug.–Oct. Ga., S. C. B.M. 4966. Mn. 5, p. 214. R.H. 1863:211. W. M.

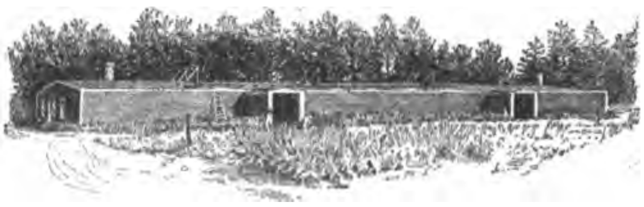
STONECROP. See *Sedum.*

STORAGE. Various ideals are confused under the denomination of storage. There are two kinds of storage: (1) Common or non-refrigerator storage, employed mostly for holding perishable commodities temporarily; (2) cold storage, in which low and even temperatures are maintained by some refrigerating process. The common storage, without refrigeration, may be again divided into two species: (*a*) the storage may be only a temporary halt, or a half-way station, on the way to the shipping point, and where products are kept for a day or are sorted and packed; (*b*) it may be a storing of products that are waiting for improved market conditions, and in which an effort is made to maintain a relatively low and uniform temperature. In this latter kind of storage, the low temperature is usually secured (1) by means of a cellar or basement building; or (2) by means of controlling air-currents and ventilation. This second type of storage, under favorable conditions, reaches approximately the same efficiency as temporary cold storage.

A few specific examples will illustrate some of the ideals and the means of attaining them. Fig. 2404 shows a cellar storehouse, such as is used by nurserymen. Sometimes these buildings are employed for the storing of apples and other products. Usually the floor is two or three feet below the level of the ground.



2403. Stokesia cyanea (× ⅓).

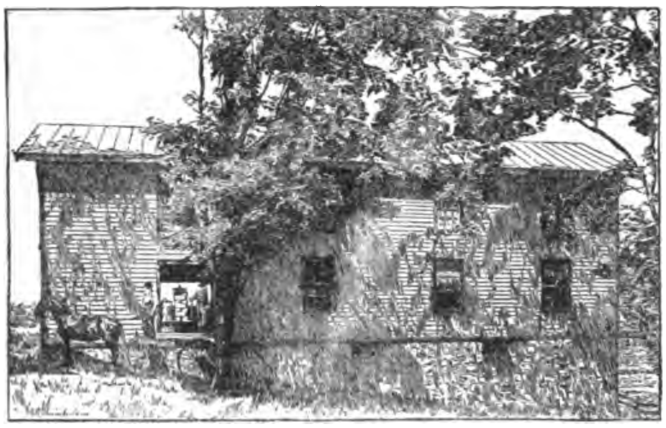


2404. A half-cellar storage.

The house shown in Fig. 2405 is built on a side hill, and the basement or cellar is used for the storage of grapes, the first floor is used for packing, and the second floor or attic for the storage of baskets, crates, and the like. This building measures 25 x 60 feet over all. The foundation walls are 24 inches thick, and the cellar is provided with ample ventilation by several outside windows, and also by means of a chimney that runs from near the middle of the cellar up through the roof. The floor is of earth. By means of careful attention to ventilation, this cellar can be kept at 50° or below during September and October, and is frost-proof through the winter. The windows are provided with close-fitting screens to keep out rats and squirrels. This cellar will easily hold fifty tons of grapes in the picking trays. The first floor is divided into two rooms, the front one being a packing-room 25 feet square, and the back room a storage and shipping department 25 x 35 feet. This front packing-room is provided with heat and is lighted by seven large windows. The floor above the cellar is double and made of 1¼-inch matched pine, with an abundant air space between the two layers. This, therefore, protects the cellar from sudden fluctuations of temperature. The building is also shaded, especially from the afternoon sun, by large trees. This building can be erected in New York for about $1,200. It has 18-foot posts, a tin roof, the two rooms in the first floor ceiled with pine, but the top floor not ceiled.

An apple storehouse in Grand Isle, Vt., is shown in Figs. 2406 and 2407, and is described by Waugh (Bull. 55, Vt. Exp. Sta.):

"The fruit house is built on high and dry ground. The cellar was three feet, and dirt taken from this was used to bank up around the wall. The wall is solid stone and mortar, is 5 feet high, 2½ feet wide at the bottom, and 2 feet at the top; 2-inch plank for sills on this, bedded in mortar, doubled so as to break joints; 2 by 4 studding above this; outside of studding matched pine, then paper, and then clapboards, painted; in middle of studding, lath and plaster; inside of studding, matched pine, then paper, and then ½-inch sheathing, painted. This gives two hollow walls, or dead-air spaces. For ventilating, there is one ventilator from cellar to the observatory on top of building, which has four large window frames, with blinds, but no tight windows. The ventilator opens into both storage rooms. We have three 18-inch windows on east and west sides of building in the cellar, and three large windows in west side, next to storeroom. Both floors are double, with paper between, and the second room is ceiled overhead with matched spruce, and painted. The two windows on east side show in cut, with the outside doors."


2405. Grape storehouse, with packing-rooms on first floor, New York.

The following sketch of a home storage plant is reprinted from Bull. 74, W. Va. Experiment Station, by L. C. Corbett: "In localities where field stone are plentiful, a satisfactory, durable and moderate-cost house can be built in the form of a bank cellar by using these stone in cement, making a grout wall. Such a wall can be constructed by unskilled workmen if properly laid out in the beginning. The plan to follow is to use broad 2-inch planks, held in place by substantial staging to form a box having a width of the thickness of the desired wall—say 18 or 22 inches. Into this box lay the dry stones, arranging them somewhat if large, but if small they may be thrown in with a shovel. Put in a layer 6 to 10 inches thick, then pour in thin mortar composed of good lime and cement until the box is filled sufficiently to imbed the stone. Repeat the operation, moving the planks upwards as the mortar sets until a wall of desired height has been built. Silo walls have been built in this fashion which were 22 feet tall, and were as solid as one continuous stone when completed. The mortar must be thin and rich in lime or cement. Lime will answer, but it is slower to set than cement, and for that reason less desirable. Such a wall can be built for about one-half the cost of the ordinary rubble wall, and will answer in every way as well.

"Ample means of ventilation must be provided in order that nature may be turned to assistance in reducing the temperature of the house as much as possible. Sewer pipes leading for some distance under ground and provided with proper stops or dampers can be very effectively used to assist in reducing the temperature during frosty nights. In addition to this the second story of the house should be provided with one or two ice rooms, according to the width of the house. The writer is inclined to favor two narrow ice rooms, one at either side of the building, with the storage room between and below the ice rooms. See plan of such an arrangement in Figs. 2408 and side elevation in Fig. 2409.

"The stone wall must have a lining in order to provide a dead-air space between it and the storage room. This can be secured by placing 2 x 4 studding against the stone wall, covering this with a durable waterproof paper, placing 1-inch strips outside of this and covering all with flooring. This will give two small air spaces between the stone or brick wall and the storage chamber. See Fig. 2409, cross section of such a wall. The ice chambers should extend the whole length of the building or storeroom. They may be as narrow as six feet, but eight feet will increase their capacity and cooling power. The floors in these rooms should be made of metal overlaid with 2 x 4's set on edge, the metal floor so arranged as to allow a free passage of air from the ice chamber into the storage room. As cold air naturally falls the slat floor in the second-story wareroom will give direct circulation into the lower wareroom, and both be cooled in consequence. The floor structure must be strong and well braced so as to carry the heavy load placed upon it. Heavy staging carrying 2 x 12 joists 18 inches apart, and floored with 2 x 4's one inch apart, will give ample support for the ice chambers and second-story wareroom. The roof to the second-story room should be built so as to make it as near a non-conductor of heat as possible. Dead-air spaces are the cheapest and most easily constructed non-conductors. This is essential in the ceiling, as it has the double duty to perform of holding the cold in and keeping the heat out. A large, well-ventilated attic space should be provided and, if possible, a shingle or slate roof used in place of metal. The ceiling in the second story must be provided with ventilator shafts carrying good dampers so that perfect ventilation can be secured during cold weather. Provision should be made the winter before for sufficient ice to cool the warerooms each fall before the fruit is brought in from the orchard. This will necessitate the construction of a reservoir and ice house with capacity sufficient to fill the ice chambers. It is not advisable, in the writer's judgment, to use the ice chambers as ice houses for storing ice; they are merely ice chests to be used to cool the warerooms and fruit as it comes from the orchard. Consequently they can be made much smaller than would be necessary were they to serve the double purpose of cold chamber and ice house."

Many small storage houses, located near railway stations, are now to be seen in the fruit sections of the country. One of these is shown in Fig. 2410. In storehouses, apples are usually stored in barrels that are piled on their sides. Fig. 2411. It is a common practice to re-sort apples in storage. Fig. 2412.

L. H. B.

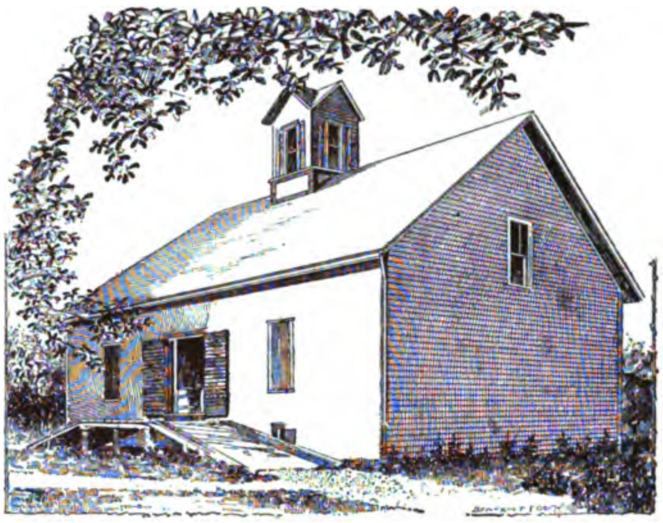
Refrigeration or cold storage is the name given to the preservation of perishable products, such as fruits and other organic foodstuffs, at a temperature so low as to arrest the action of ferments and mould, and yet not low enough to destroy the flavor or cellular structure of the material so stored.

This process of preserving organic substances has been known since the earliest civilization, and while it was used to a limited extent in those localities where an abundant supply of natural ice was available, the process did not come into general use until the machinery for producing artificial cold and artificial ice was perfected. Various principles have been employed in the development of this machinery, but all have involved the fundamental idea of the condensing of a gas and the heating of it on again expanding, when it takes up the latent heat of compartments in which such expansion takes place. For this purpose carbon anhydrate and ammonia anhydrate have chiefly been employed. After the cooling has been effected by artificial means or by ice, cold storage can only be accomplished by maintaining a desired temperature over a long period. In order to secure this, the compartments in which the products for storage are to be held must be as perfectly insulated from outside heat as possible.

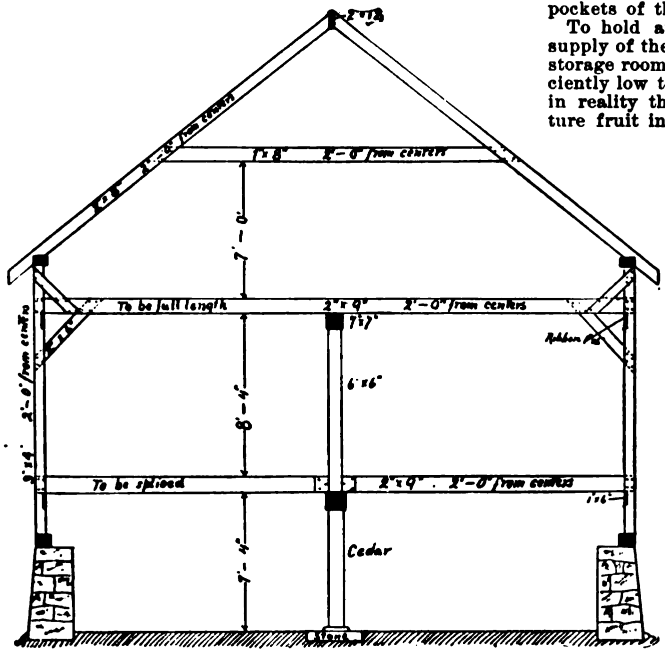
Successful experimental refrigeration by mechanical means was accomplished as early as the middle of the eighteenth century, but no successful commercial application of cold storage was made until after the invention of Lowe's "carbonic acid" machine in 1867, although the present growth of the industry is due to the invention of the ammonia compression machine by Professor Carl Linde in 1875.

The process was first extensively applied to the preservation of meats, fish, etc., but as early as 1881 the Mechanical Refrigerating Company of Boston opened a cold storage warehouse, which marks the beginning of mechanical refrigeration as applied to horticultural products. Other companies were then organized, until now there are about 1,200 refrigerating plants in the United States, of which about 600 are used mostly for horticultural products. Foreign countries are now following the example of the United States, and London, Liverpool, Glasgow, Paris and other European cities offer facilities for storing such products. In the United States, Chicago is the great center for fruit storage, single firms holding as many as 100,000 barrels a year. Apples are the principal storage fruit, good winter sorts holding their form, color and flavor better than any other commercial fruit when held for long periods in cold storage. Another reason why the apple is a favorite in cold storage is that people use it continuously over a long period. A good apple is always a relish. The apple, too, is the fruit which best pays the producer to hold in cold storage.

From the nature of the case, mechanical refrigeration will usually be confined to transoceanic trade, and to cities and towns where the principal business of the refrigerating machinery will be the production of ice for commercial and domestic use, the cold storage warehouse being a side issue to ice-making. The fruit-grower who wishes to avail himself of the advantages of cold storage must either ship his product to the city or depend upon natural ice to reduce the temperature of his warehouse. If he is in a climate where a supply of natural ice is available, his most economical plan is to make provision to use it. If in the far South he must own an ice plant or purchase artificial ice.


2406. Apple storehouse in Vermont.

To successfully handle peaches and plums in carlots, one must nowadays have a supply of ice in order to avail oneself of the best service of the Fruit-Growers' Express or other lines The cars come iced, it is true, but before starting them on their journey it is safest for the grower to have a sufficient supply of ice to fill the pockets of the car



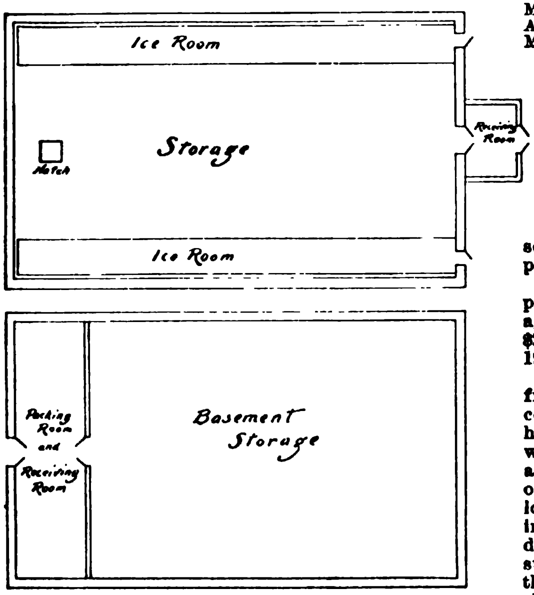
2407. Structural details of the building shown in Fig. 2406.

To hold apples from harvest time until the oversupply of the season shall have been removed, requires storage rooms artificially cooled to a temperature sufficiently low to check the process of ripening, which is in reality the conversion of the starch of the immature fruit into sugar. As long as the starch remains as such, fermentation and decay cannot act, but as soon as sufficient water and heat are added to convert the starch into sugar, ripening proceeds until fermentation and decay complete the work. The object of cold storage, then, is to check the ripening process, or, if the fruit is ripe, to maintain a temperature sufficiently low to check fermentation. Theoretically, then, green or immature fruits will keep better than ripe ones. Green fruits should keep as well at 36° as a ripe fruit at 32°, and this is in accord with experience.

To successfully hold fruit in cold storage, three conditions are essential: (1) a low temperature; (2) an even temperature, and (3) sufficient moisture to prevent shrinkage, thus keeping the fruits plump and crisp. Even in storage rooms in which the humidity of the air remains saturated, as indicated by the ordinary wet- and dry-bulb thermometer, considerable loss of moisture will take place from fruits stored in crates or open bins, while much less is lost by those stored in tight receptacles. Individual Baldwin apples under observation in a room at 32° F., from January 4 to

April 20, showed losses as follows: Open shelves, 5.364 grams; in sealed cans, .602 grams; or a difference of 4.762 grams in favor of the sealed cans. This at least suggests the possibility of checking loss in weight by the use of non-porous storage receptacles. Barrels do not have any marked effect in checking this loss, as fruits stored in headed and open barrels differed only one-half pound in amount of loss during a period of 147 days, the total loss being 4¾ pounds on a barrel of 139¾ pounds weight when placed in storage.

The efficiency of a cold storage house depends more upon the construction of the walls than any other single feature. Perfect insulation is the ideal mark at which to aim. The more perfect the house in this respect, the less wear upon the machinery when refrigerating apparatus is used, and the greater the economy in ice when ice is used. To accomplish this, non-conductors of heat should be used as far as possible in the details of construction. For this purpose brick is superior to stone, and wood is a better non-conductor than either. For permanence, however, efficiency in this respect must be sacrificed. But as confined air may be better than an artificial substance, by multiplying the layers or partitions in a wall "dead-air spaces" can be increased and nearly perfect insulation secured. For the practical orchardist, however, cost must be considered, and if wood and paper can be made to take the place of brick at a sufficiently less cost, permanence may be overlooked. This can be done, and with these cheap materials very satisfactory results obtained. After proper insulation comes ventilation. With ice-cooled houses advantage should be taken of all assistance which nature can lend. With proper ventilating shafts for carrying off heat and moisture and ample subterranean pipes arranged to admit chilled air from naturally cool places such as ravines, the temperature of the house can be greatly lowered during frosty nights, and the store of ice husbanded to that extent. During the winter months outside cold can be admitted and housed up to maintain a low temperature far into the summer. The cold storage of apples has now grown to be such an important factor in the markets that reports are made from time to time to give an idea of the quantity of fruit available, and to be used as rational basis for fixing the selling price of apples at any given season.



2408. Plan of a home-built iced storehouse. First floor in upper cut; basement in lower cut.

The following figures, as reported by the National Apple Shippers' Association, will serve to show, not only the method, but the magnitude of the storage business as well:

Year.	Common storage. Barrels.	Cold storage. Barrels.
December 1, 1898	400,000	800,000
December 1, 1899	634,500	1,518,750
December 1, 1900	792,000	1,225,000

The following table, which gives the range of prices paid for apples from the end of the picking season to the end of the storage season for the years 1896 to 1900, inclusive, is compiled from the weekly market reports on the Baldwin apple for New York city as published in the *American Agriculturist:*

Month.	Season of 1896–7.	Season of 1897–8.	Season of 1898–9.
Nov. 1	$1.00	$1.50 to $2.00	$2.50 to $2.75
Dec. 1	.85 to $1.00	2.50 to 3.00	3.00 to 4.00
Jan. 1	1.00 to 1.12	2.00 to 3.50	3.00 to 3.50
Feb. 1	1.00 to 1.50	2.50 to 3.75	4.00 to 4.50
March 1	1.25 to 1.50	2.50 to 3.50	2.50 to 4.50
April 1	1 25 to 1.50	2.50 to 3.50	4.00 to 4.50
May 1	1.50 to 2.50	2.75 to 3.75	3.75 to 4.50

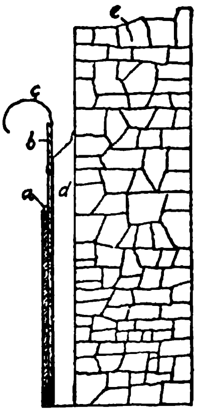
Month.	Season of 1899–00.	Season of 1900–01.
Nov. 1	$1.25 to $2.00	$1.25 to $1.50
Dec. 1	1.25 to 2.25	2.00 to 2.50
Jan. 1	2.00 to 2.75	2.75 to 3.00
Feb. 1	3.00 to 3.50	1.75 to 3.25
March 1	2.50 to 3.50	2.25 to 3.50
April 1	3.50 to 4.25	
May 1	4.00 to 4.75	

Ben Davis ranged higher at the close of the storage season, but as it was difficult to secure consecutive reports of that apple the Baldwin was chosen instead.

This indicates the margin of profit there is for the producer in holding his fruit in cold storage. The average is $2.37½ per barrel, which gives the aggregate of $2,899,375 on the apples in cold storage during the year 1900.

The apple, grape and pear are important cold storage fruits in eastern United States. The great profit of cold storage to the grower has come through enabling him to withhold high-grade fruits, and even varieties which keep poorly in common storage, from the market at harvest time. Desirable sorts which are normally out of market by Thanksgiving time can be held much longer in cold storage and the profit from them greatly increased. The idea that summer sorts can be made to do duty as winter sorts through the agency of cold storage cannot be realized. For the best results only the choicest specimens of the winter sorts should be allowed to go into storage outside the farm warehouse.

Besides the great revolution and development in apple growing which has resulted from the addition of cold storage to the trade, a corresponding growth and spread of the peach, strawberry, cherry and plum industry have resulted from the development of the refrigerator car service. As early as 1865 attempts were made to carry perishable products such as peaches, raspberries and strawberries long distances in refrigerating boxes and artificially cooled cars. While these early experiments must be counted as failures, they led up to the present extensive fruit-transportation business, which is conducted on the same idea as the Pullman sleeping car—that is, of providing refrigerating cars, which run over certain roads, gathering the fruit from areas having a large output, re-icing the cars at given points, and carrying the product for many days in good order. The development of this industry was due to the skill of Mr. F. A. Thomas, of Chicago, in coöperation with Parker Earle, then of Cobden, Ill.



2409. Detail of wall of storehouse.

a, Flooring; *b*, furring strip; *c*, paper; *d*, 2x4; *e*, 18-inch stone wall.

With the application of refrigeration to the storage room of ocean liners, Australia, Tasmania and New South Wales become our competitors in the apple and orange markets of the world. This business has long since passed the stage of an experiment, and the annual tonnage of such products is rapidly increasing. It is no longer ago than 1888 that the Oceana carried the first cargo of apples in cold storage from Melbourne to England, and tne first cargo of West India fruits was carried in 1886 by the ship Nonpareil. Now California is able to ship peaches and plums in refrigerator cars to New York, and thence to Liverpool by cold storage on shipboard, and put the products in good order on the English markets. With refrigeration, time is of less importance than rehandling, shaking and a constant temperature.

Storage machinery has been greatly modified during the past two years. Small condensers, propelled by gas engines, water-motors and even windmills, are now available for use in hotels, meat shops and places where constant cold is needed. While these small plants have not been used in private storage houses with limited capacity, there is no good reason why they should not be. In large cities central refrigerating plants distribute chilled brine through properly insulated pipes to dealers and commission men, much after the manner of water and gas. The dealer is then independent of the market, and if a consignment of fruit is received too late for the week's trade it can be held in the cold room with security for the Monday morning market. With this plan, a large number of dealers in the business quarter of any city can be supplied with cold at a moderate cost from a single central station.

In modern cold storage two systems are in common use: one is known as the "direct expansion system," and operates by allowing the compressed gas to expand in coils of pipes placed in the room to be cooled; the other is known as the "brine circulation system," and operates by pumping chilled brine of one of the salts, sodium, calcium or potassium chloride, through coils of pipe in the room to be cooled. Both these systems present objections, which are of greater moment to the horticulturist than to any other class using cold storage. The temperature in the immediate neighborhood of the cooled coils is so low as to freeze the fruit stored there. In order to overcome this, a system in which no pipes are placed in the chilled or storage room has been devised. A coil of pipe is arranged for direct expansion and the air of the room to be cooled is drawn out by a fan, passed over the chilled pipes, the temperature lowered, and again carried back to the cold room into which it is distributed from the ceiling by large wooden conduits with numerous dampers and openings, so that the cold can be distributed evenly through the room by the constantly moving air. With this arrangement the temperature can be kept constant and uniform throughout all parts of the room, and there is no loss from freezing.

The following table of temperatures, compiled from experience of practical storage men, will serve as a guide for storing horticultural products:

Articles.	Remarks.	Degrees F.
Apples		32-34
Bananas		34-36
Berries, fresh	For three or four days	34-36
Canteloupes	Carry only about three weeks	32
Cranberries		33-34
Dates, figs, etc		34
Fruits, dried		35-40
Grapes		33-36
Lemons		34-40
Oranges		36
Peaches		35-45
Pears		36-40
Watermelons	Carry only about three weeks	32
Asparagus		34
Cabbage		32-34
Carrots		33-34
Celery		33-35
Dried beans		32-40
Dried corn		35
Dried peas		40
Onions		32-34
Parsnips		33-34
Potatoes		34-36
Sauerkraut		35-38

"Asparagus, cabbage, carrots, and celery are carried with little humidity; parsnips and salsify same as onions and potatoes, except that they may be frozen without detriment.

"Apples when stored in barrels should not be stored on ends, but preferably on their sides. Fig. 2411. A temperature of 32° is considered most favorable.

"In general, green fruits and vegetables should not be allowed to wither. Citrous fruits and vegetables should be kept dry until the skin loses its moisture; then the drying process should be immediately checked. For bananas no rule can be made. The exigencies of the market must govern the ripening process, which can be manipulated almost at will.

"Fruits, especially tender fruits, should be placed in cold storage just when they are ripe. They will keep better than if put in when not fully ripe. Pears will stand as low a temperature as 33°. Sour fruit will not bear as much cold as sweet fruit. Catawba grapes will suffer no harm at 26°, while 32° will be as cold as is safe for a lemon.

"The spoiling of fruit at a temperature below 40° F. is due to moisture. In storing apples, eight to ten cubic feet storage room space is allowed per barrel, and twenty to twenty-five tons daily refrigerating capacity per 10,000 barrels." L. C. Corbett.

2410. A storage house in western New York, built with particular reference to storing apples.

Treatment of Fruits Intended for Cold Storage.—Cold storage has come to be a factor of prime importance in the marketing of many fruits, especially in apples, pears and grapes. With the more perishable fruits, like berries, peaches and plums, it is but little used, largely for the following reason: The action of cold in preserving fruits depends on two things; first, it retards those normal bio-chemical changes in the tissues of the fruit that are concerned in the process of ripening. It is a matter of common observation that apples, for instance, stored in a warm room ripen and become mellow much quicker than those in a cold cellar. Second, if the degree of cold is sufficient, it prevents partially or entirely the growth of those bacteria and fungi that cause decay. In peaches and other perishable fruits the changes concerned in the normal process of ripening take place much more rapidly than in winter apples or other fruits that are naturally good keepers. By the time the more perishable fruits reach market, in the ordinary course of events, these changes have already progressed so far that it is necessary to dispose of the fruit at once in order to avoid loss. If, now, market conditions are unfavorable and it is decided to place the fruit in cold storage to hold it for a better market, the chances are against success, for the ripening changes have already progressed almost to the limit of safety and, while the cold checks, it does not entirely prevent them. The usual result is that, even though they may look fairly well while still in the cold chamber, the goods go down quickly on reaching the warm outside air. When for any reason it is desirable to hold perishable fruits in cold storage, it is essential that great care be used in selecting only perfectly sound, full-grown but unripe specimens, and that these be placed as soon as possible after picking in a refrigerator car or an ice-box for transportation to the storage rooms. No perishable fruit that has been exposed to ordinary temperatures for twenty-four hours after picking is in fit condition for storage. Too many people have made the mistake of supposing that by placing fruits on ice they could, as it were, rejuvenate them and that they would come out sound and firm even if at the point of decay when they went in. It should be borne in mind that the life or keeping quality of any fruit is self-limited, that the processes of ripening and subsequent deterioration are constantly going forward, and that the best that we can do by cold storage is to retard them; we cannot prevent them entirely.

These considerations apply with equal force to the storage of those fruits that are naturally good keepers. Grapes and pears, if the weather is warm, should always be shipped to the point of storage in refrigerator cars, and in many cases this would doubtless be profitable even with apples. A week of warm weather after apples are gathered and while they are in transit will inevitably so stimulate the ripening processes as to greatly impair their subsequent keeping quality, especially their ability to stand up and make a good showing after coming out of storage. Then, too, the exposure for even a few days to warm conditions after picking is sure to stimulate the growth of fungi and bacteria, thus starting many spots of incipient decay that cannot be entirely checked by subsequent refrigeration. It is probably safe to say that the keeping quality of any given lot of apples depends as much on its history during the period from the time of picking till it goes into storage as upon any other factor. F. S. Earle.

Management, Temperatures and Prices.—The rapid advancement of the cold storage industry should be of great interest to the horticulturist. It is now possible to secure all the benefits, with a comparatively small investment. Mechanical refrigeration is best accomplished by employing what is known as the compression ammonia process. Anhydrous ammonia, i. e., ammonia free from water and held in liquid form only under great pressure, is allowed to expand and vaporize in pipes submerged in brine. The ammonia, in changing from a liquid to a gaseous condition, absorbs the heat from the liquid in which the pipes are submerged. In this manner it can be brought to a temperature of zero, or lower. This cold liquid (brine) is circulated through pipes placed in the room or rooms that are to be refrigerated. The ammonia, after absorbing its quota of heat, is again compressed to a liquid condition by mechanical means and used over and over without limit. Any liquid that boils at a very low temperature can be substituted for ammonia, but at the present, viewed from an economical and practical standpoint, ammonia is given the preference. The temperature of a storage room is controlled by the volume and temperature of the brine circulated.

2411. The piling of barrels of apples in a cold storage house.

Apples are best preserved at a temperature of 30° F., two below the freezing point. It is generally conceded that they should be taken from the tree as soon as matured and colored, immediately put in a cold room and the above temperature maintained until they are taken out to be placed on the market. They will come out with a minimum amount of decay, crisp, full-flavored, and in condition to "stand up" much longer than if carried at a higher temperature. Bartlett pears put in while green and as soon as the stem will cleave from the twig, at a temperature of 32°–33°, carry for two months to ten weeks. Ventilated barrels are sometimes used, but slatted bushel crates are preferable. Winter or late varieties of pears will carry much longer. Peaches and other stone fruits will take a temperature of 36° and are not, as a rule, carried successfully to exceed two weeks. They are very deceptive; the outside will appear satisfactory, but the fruit will be tasteless, and around the pit it will be black and in a semi-decayed condition. Berries, one week to ten days at a temperature of 38°, will, if they are not bruised or broken, carry nicely and many times tide over an overstocked market.

2412. Re-sorting apples in a storehouse.

Tomatoes, if sound, not broken or bruised, picked before they are thoroughly ripe, will, at a temperature of 40°, carry three to five weeks. Celery, if dry and sound, should, at a temperature of 34°, carry from three to four months. Vegetables, such as carrots, parsnips and turnips, at a temperature of 34°, carry successfully until June or July; if decay has set in before the products are placed in cold storage it will not be entirely stopped but only arrested in a moderate degree, and to obtain any measure of success nothing but sound, perfect goods should be placed in the refrigerating rooms.

The following are the charges usually applied by those conducting public cold storages: Apples, 15 cents per bbl. first month, 10 cents each additional month; celery, 10 cents per case first month, 6 cents each additional month; cherries, ½ cent per lb.; grapes, ⅓ cent per lb. first month, 1-5 cent each additional month; maple sugar, ¼ cent per lb. first month, ⅙ cent each additional month; pears, per bbl., same as apples; per ½ bbl., 10 cents first month, 7 cents each additional month; pears in bushel crates, same as in ½ bbls.; quinces, same as apples; vegetables, 25 cents per bbl. first month, 15 cents each additional month; vegetables, per case, 15 cents first month, 10 cents each additional month. If in very large quantities, season rates are sometimes made at comparatively lower rates.

Mechanical refrigeration is surely of paramount importance to the producers of vegetables, fruits, eggs, butter, etc. It provides a means by which they are not compelled to accept ruinous prices of an overstocked market, nor obliged to sell when products are harvested, regardless of price, nor to force their products on the market in such quantities as to cause a glut. Instead of having supplies that must be sold within a few days, the horticulturist can, by taking advantage of mechanical refrigeration, extend the market season fully 50 per cent, or until such time as the demand equals the supply.

Samuel R. Mott, Jr.

Practical Experience with Cold Storage.—The experience of those who have had occasion to use cold storage is remarkably varied, scarcely two of them having formed the same impression in regard to its effect. But the very fact that perishable articles have been preserved for long periods shows that there is at least one right way, and the managers of cold storage plants are learning what that right way is.

One great trouble has been that hardly two articles require the same temperature to keep in proper condition; in fact, the different varieties of apples require different degrees of temperature, and it took a long time to learn this. Again, it is almost impossible to maintain the same temperature in all parts of a large building or even in one large room. As a rule, each variety of fruit or vegetable should have a separate room, and the keeper should know what degree of temperature is best for each. Some varieties of apples have the reputation of keeping better in cold storage than others, but it is only because one had a temperature suited to it and the other did not. A car-load of apples may have come from the orchard where the fruit had been exposed to the hot sun and attained a temperature of perhaps 80° and was then placed in a room with other car-lots which were at the proper temperature. In twelve hours the temperature in the room would rise to 50°, and with the best of management it would require forty-eight hours to reduce the temperature to the proper mark; this could not be otherwise than injurious to the entire lot.

It has not yet been fully settled what is the proper degree of temperature to be used in keeping the various fruits and vegetables. Keepers of cold storage plants differ somewhat on this point, and it is probable they all try to maintain a degree too low for most of our products. The writer believes the temperature most suitable for all (if we must use one for all products) would be 34°.

It is not important what kind of a building is used, whether wood, stone or brick, but it is very desirable that it should be divided into many rooms, so that each product may be stored in a separate room; and where large quantities of apples are stored, each variety should occupy a separate room and the keeper should have perfect control of each room and know the required degree of temperature for each article and maintain it. When this is done, cold storage will be a great success.

J. C. EVANS.

Refrigerator Cars.—The invention and development of the refrigerator car have proved to be very important factors in fruit production and marketing, making it possible to market in good condition the most tender fruits two to three thousand miles from where they are grown. Prior to the days of the refrigerator car, strawberries if shipped by freight more than one or two hundred miles usually arrived in bad order and were very unsatisfactory to both dealer and consumer, and, except for the first few early shipments, prices were very low. It was only at the ripening of "home-grown strawberries" that for two or three weeks any market was satisfactorily supplied, and the public readily paid two and three times the price they would for "shipped-in berries" a few weeks earlier.

2413. Icing cars (at the top) at one of the stations of the Fruit Growers' Express, Georgia.

GENERAL LIBRARY
UNIV. OF MICH.

Now, with refrigerator cars of strawberries coming in from Florida in February and along up the coast till well into July, when the last strawberries come in from Maine and northern New York, berries just about as fresh and bright as "home-grown" are to be seen in all our eastern markets for a season of five months. Chicago and other western markets are in like manner supplied from Texas to northern Wisconsin and Michigan.

Without the refrigerator car, the great peach orchards of Georgia and Texas would not be practicable, as the most of their fruit must be sold at the North. The "peach season" now extends from May till November. The "seasons" of other fruits are likewise extended in a less degree, and the failure of the local crop in any one section now has little effect on the local market. Michigan or Missouri may be sending peaches to New York, Boston and Philadelphia one season on account of a failure of the crop in Delaware, New Jersey and Connecticut; while the next year a failure of the crop at the West enables Connecticut, New Jersey and Delaware to return the compliment and supply Chicago, St. Louis and Minneapolis. Yet without the refrigerator car such reciprocity would be almost impossible, except in the most favorable seasons. The refrigerator car is really a great ice-chest on wheels. Most of these cars are constructed with ice-bunkers at each end of the car, with a capacity of 4 to 6 tons of ice for each car. Fig. 2413.

One style has some two feet of the whole top of car as an ice-bunker, and is one of the best of cars if kept fully iced all the while in transit. Railroad people object to it slightly on account of being top-heavy, and when not full the ice slides from one side to another going around curves, etc. Most of the leading railroads of the country own a number of refrigerator cars, and these are furnished free to shippers who do their own icing. There are several refrigerator car companies which own and operate cars, and for a specified sum they attend to loading the car and all the icing at initial points and look after re-icing *en route*,—in fact, guarantee refrigeration until car is unloaded. This is the most expensive service, but is safest and best for long distances. But for one and two days' shipments, where the cars do not require re-icing, the shipper can save money by using the railroad refrigerators and do his own icing, and there is no good reason why the leading railroads cannot establish icing stations and re-ice their own cars, charging the expense along on the freight bill.

In loading a refrigerator car, care is taken that an opportunity is provided for air circulation around each package; this is accomplished by properly spacing the first row of packages, then by "stripping" across the tops of these two strips about 1¼ in. square, tacking a small nail down through them, one into each package. The packages are held in place, and the strips serve for the next tier of packages to rest on and leave an air space of an inch between the two layers. In this way cars are loaded full up to eighteen inches or two feet of the top, care being taken usually to have the ripest or poorest carrying fruit in the bottom of the car, and the firmest, long-keeping at the top; for if the ice-bunkers are not kept "chock-a-block" full all the time, the top tiers do not get as good refrigeration. It is also the custom of many marketmen on unloading these cars to sell out the top tiers first, for the bottom-tier fruit keeps best; while often in case of fruit picked a little too green, top tiers show up best and bottom tiers are stored out of the car a day before being offered for sale. The best results in refrigerator car service are attained when the car has been iced at least twelve hours before loading, and the loading is quickly done by opening the car doors only a few times.

The writer's own plan, when fruit is abundant, is not to start loading a car till he has fruit enough packed to fill it; then with a gang in each end of the car to properly space the packages and do the "stripping" and nailing, open the doors and rush in all the middle of the car will hold, then close the doors, and, by lantern-light, work goes on inside till all these packages are placed, when more are handed in and the car quickly filled. In this way a car an hour is often loaded all day long in the Georgia peach orchard. Where small lots are put in by many different growers and the car is one or two days loading and opened many times, the fruit is not so quickly cooled down and, even with the same attention *en route*, never arrives in market in as sound condition as when the car is quickly loaded. Another very important point is the first re-icing. When 400 to 700 warm packages of fruit are put into a refrigerator car, ice begins to melt very rapidly and in a few hours one-half or more of the ice has melted away, the upper part of the car inside is a steaming sweat-box, and it is of vital importance that ice-boxes be promptly refilled solid to the top, so that the whole inside of the car be brought to a low temperature as quickly as possible. Once get all the heat out of the fruit packages and the ice-boxes then full, and a car may go a long time without re-icing and yet carry fruit in good order. But neglect the first re-icing twelve to fifteen hours, and there is always danger, while for best service from start to finish the ice-boxes should be kept full all the time. The most ice will be consumed in fruit-loading and in the first twelve hours thereafter.

When well re-iced *en route* refrigerator cars arrive at destination with bunkers nearly full of ice, and in many of the smaller markets, where a car-load of high-priced fruit cannot be sold in a day, dealers often use the cars for storage purposes, re-icing when necessary. Peaches from Georgia handled in this way have been sold in the smaller cities of New York and New England in perfectly sound condition ten days to two weeks after being picked ripe from the trees. J. H. HALE.

STORAX. See *Styrax.*

STORK'S BILL. *Erodium* and other members of the Geranium family.

STOVE PLANTS. The term "stove" applied to plants undoubtedly originated from the method of heating the structures in which plants were grown before the advent of hot water and steam. Glasshouses such as then existed were heated by stoves and flues, usually made of bricks. Such structures came to be called stovehouses or stoves, and the plants grown in them "stove plants." (A "greenhouse" was in those days an unheated glasshouse in which plants were merely kept alive over winter.) These terms still exist in England, but are applied to strictly tropical plants or those requiring a warm temperature for their successful culture in glasshouses. In this country such plants are spoken of as warmhouse or tropical plants.

In England, at the present time, more distinction is made in the names applied to plant houses than in this country. For instance, "greenhouse" in England now means the coolest glasshouse only, while in this country the name is usually indiscriminately applied to all glasshouses. The names applied to plant houses in England are therefore: Stove, for tropical plants; intermediate house, for plants hailing from warm-temperate climates; greenhouse, for those plants requiring the least degree of heat. A conservatory or show house is one in which plants are placed while in flower and usually kept at a cool temperature.

In practice such terms may be greatly modified to suit local conditions; for example, at the Botanic Gardens of Smith College, Northampton, Mass., the glasshouses are named cool-temperate house, warm-temperate house, tropical house, palm house, acacia and succulent house, experiment house and propagating house, the temperatures and moisture conditions being regulated to suit the requirements of each class of plants.

The cultivation of stove plants is too heterogeneous a subject to be treated exhaustively in a single book, because the stove contains thousands of dissimilar plant treasures from the tropics, especially those found at low altitudes. In general, the stove is the house which requires the most expense and care, the greatest heat and the highest atmospheric moisture. For the general principles of its management, consult *Greenhouse Management.* EDWARD J. CANNING.

ST. PETER'S-WORT. *Ascyrum stans.*

ST. PETER'S WREATH. *Spiræa hypericifolia.*

STRATIÒTES (Greek, *soldier;* referring to the sword-shaped leaves). *Hydrocharidàceæ.* The WATER SOLDIER, or WATER ALOE, is a hardy aquatic plant of small ornamental value but considerable botanical interest. It is native to lakes and watery ditches throughout Europe, and has a rootstock creeping in the mud which produces at the bottom of the water tufts of long, narrow, sword-shaped lvs. bordered by small spiny teeth somewhat after the fashion of Pandanus. The fls. are small, white, 3-petaled, and borne on peduncles which rise to a few inches above the water. The peduncle is much thickened at the top and bears a spathe of 2 bracts about an inch long. The male fls. are several in a spathe, stalked, and have usually 12 or more stamens. The female fls. are solitary and sessile in the spathe. The plant has a distinct calyx, which is not the rule among monocotyledons. **Stratiòtes aloìdes,** Linn., is the only species in the genus. It is sometimes called Crab's Claw or Freshwater Soldier. In England the planting of this species is discouraged from the fact that it spreads too rapidly. Technical characters: peduncles rising from among the lvs. to a few inches above the water, much thickened at the top, bearing a spathe of 2 bracts: ovary and stigmas nearly as in Hydrocharis, but the fruit is ovoid and somewhat succulent. It is offered by one American specialist in aquatics. W. M.

One of the peculiarities of Stratiotes is that in summer the whole plant rises to a point near the surface when it is only partly submerged, and later in the season it drops below the surface. Young plants do not act thus. It is propagated by side shoots from the base of the leaves. Toward fall and early winter these shoots are merely bulblets and are readily detached from the plant and are in a good condition for traveling WM. TRICKER.

STRAWBERRY. Plate XXXVIII. The Strawberry is an herbaceous perennial. It naturally propagates itself by means of runners that form chiefly after the blooming season. These runner plants, either transplanted or allowed to remain where they form, will bear the following year. Usually the plants will continue to bear for five or six years, but the first and second crops are generally the best. It is therefore the custom to plow up Strawberry beds after they have borne from one to three crops. The better the land and the more intensive the cultivation, the shorter the rotation. In market-gardening areas and in some of the very best Strawberry regions, the plants are allowed to fruit but once. The plants therefore occupy the land only one year and the crop works into schemes of short rotation cropping. The Strawberry delights in a rich, rather moist soil and a cool season. It can be grown in the cool part of the year in the South and thereby becomes one of the most cosmopolitan of fruits. The young plants may be separated from the parent and put into new plantations in August; but under average conditions in the North it is usually better to wait until the following spring, since the weather is likely to be too hot and dry in the late summer or fall. Plants that have not borne are best for setting. They are plants of the season: that is, plants which start in the spring of 1901 are fit for planting in the late summer or fall of 1901 or in the spring of 1902. These plants have many long, fresh, light-colored roots. Fig. 2414 shows such a plant, with the roots trimmed for planting. Fig. 2415 shows a plant that has borne. This plant bore fruit in 1900, and has thrown up a new crown in 1901. The old dead crown is seen on the right. The young growth is lateral to this old crown. The roots are relatively few and are hard and black. These plants sometimes make good plantations under extra good care, but generally

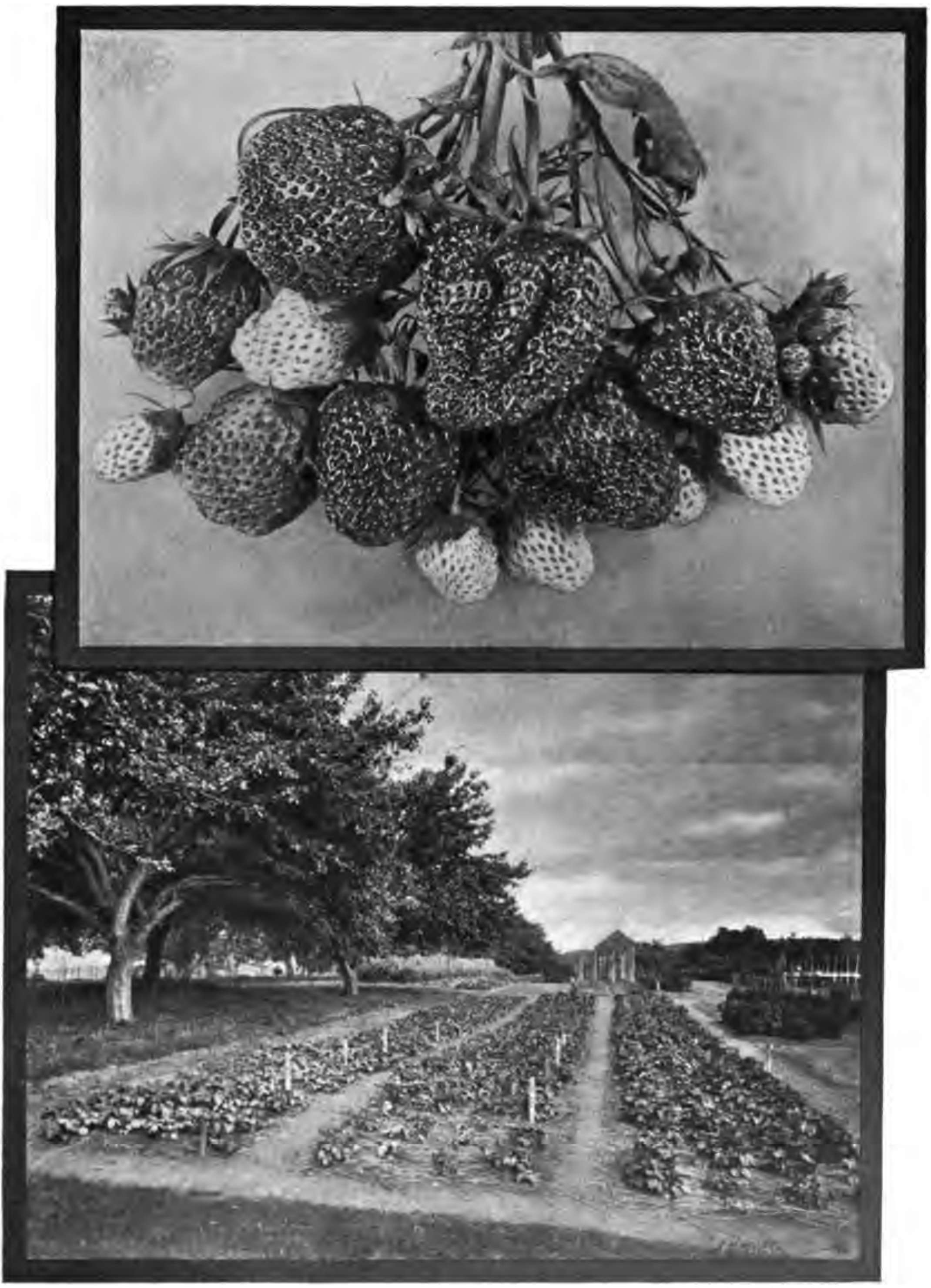


Plate XXXIX. Strawberry test ground, with a truss of the Greenville variety.

they should be avoided. Pots are sometimes plunged under the new runners in June and July, and they become filled with roots by August or September. These pot-grown plants are excellent for fall setting in the home garden, but they are seldom employed in extensive commercial practice. Fig. 2416.

In Florida, according to Rolfs, beds need to be reset annually, in September or October; plants set at this time produce a good crop in the following February, March and April. The plants may be produced at home, or they may be secured from the North. Excellent plants for Florida conditions are procured from North Carolina.

2414. Strawberry plant ready for setting.

For the very finest berries, each plant is allowed a space or hill by itself, and cultivation is given both ways. For general commercial results, however, plants are generally set in narrow rows. The old method was to plant in rows 3–3½ feet apart and the plants from 12–15 inches apart in rows, keeping off the runners until late in July and then allowing the runners to grow and root at will, making a matted row. In this system some plants are almost on top of others, the roots barely in the ground, and they suffer in a season of drought. The rows are so wide that to pick fruit in the center it is almost necessary to crush fruits on the outside of the row. This system gives few large first-class fruits, and is now passing away. The up-to-date grower starts with the assumption that the largest and highest colored fruits are found on plants along the outside of the rows, and therefore he plans to have as many outside rows as possible. This he accomplishes by having his rows closer together and much narrower. The rows are made from 30–36 inches apart and the plants from 18–24 or even 30 inches apart in the rows, much depending on the prolificacy of the variety as a plant-maker. If the plants used for a new bed are strong and start into growth vigorously, the first runners are used, as it has been found that under most conditions the plants about twelve months old yield the greatest number of fine fruits. These first runners are usually "bedded in," i. e., planted by hand, training them along the wide way of the rows, using from four to eight of the first runners and cutting off those growing later. This method of planting allows cultivation both ways until the runners start, retaining moisture and saving labor in hoeing. This system is shown, in a full-bearing bed, in Fig. 1486, Vol. III.

Strawberries are usually mulched in the fall in order to protect them in the winter and early spring and to prevent the soil from heaving. In some cases the mulch is allowed to remain on the plants rather late in the spring, in order to retard the season of bloom. Sometimes the crop may be retarded a week or ten days by this means, and cases are reported in which it has been delayed with commercial results somewhat longer than this. The mulch is usually more necessary in regions of light and precarious snowfall than in those in which the snow blanket is deep and lies all winter. In regions of deep and continuous snowfall, a heavy mulch is likely to prove injurious. Experience has shown that the best mulch is usually some strawy material. Along the seacoast, salt hay from the tide marshes is much used. In interior places clean straw, in which there is no grain to sprout and to make weeds, is very largely employed. Fig. 2417. In the South, pine needles are used. Sometimes loose strawy manure is used, and the mulch adds fertilizer to the soil as well as affords protection. Under ordinary conditions the mulch is three or four inches deep over the plants after it is fairly well packed down. It is not always possible, however, to mulch as heavily as this, since the material is likely to be expensive when one has a large area. The mulch is usually applied late in the fall after the ground has frozen, and if the material is abundant both the plants and the intervening spaces are covered. In the spring the mulch is raked from the plants as soon as they begin to start. Some persons allow it to lie between the rows as a cover to retain moisture and to keep the berries clean. The most expert growers, however, prefer to take the mulch from the field and to till the plantation once or twice before the plants are in bloom. The material is sometimes returned and spread on the loose soil between the rows. In the northern prairie states, heavy mulching is essential. Professor S. B. Green advises for western Minnesota and Dakota a covering of at least six inches of straw. This mulch is easily provided, since straw is so abundant in that country that it is often burned as the readiest means of getting rid of it. When not mulched in that region, the plants are likely to be killed outright or to start with a very weak growth.

Strawberry flowers may be either perfect or imperfect, and the nature of the flower is characteristic of the variety. In some kinds, the flower is perfect or hermaphrodite (having both stamens and pistils) and is consequently self-fertile. In others it is pistillate, producing no pollen, and requiring a pollen-bearing variety to pollinate it. Fig. 2418. There are no varieties bearing only staminate or sterile flowers. The perfect-flowered varieties differ greatly in the amount of pollen they produce. Some, as the Crescent and Glen Mary, bear so few sta-

2415. Old Strawberry plant, usually not desirable for setting.

mens that they are practically pistillate or sterile. Any variety will fertilize any other variety if it bears sufficient pollen and if the two kinds bloom at the same time. When planting pistillate varieties, every third row should be a pollen-bearing kind. The horticultural bearing of the sexual characters of the Strawberry flower seems to have been first clearly explained in this country by Nicholas Longworth, of Cincinnati (see *Longworth;* also his essay on the subject in his "Cultivation of the Grape," 1846, and the "Strawberry Report" of the Cincinnati Horticultural Society, 1848). When many of the akenes or "seeds" of the Strawberry are not fertilized or are killed by frost or other means, the berry fails to develop at that point and a "nubbin," or imperfect berry, is the result. Fig. 2419. Nubbins are usually most abundant late in the fruiting season, when the pollen supply is small and when the plants are relatively exhausted.

2416. Pot-grown Strawberry plant.

The cost of growing an acre of Strawberries under commercial conditions in Oswego county, New York (which is one of the leading Strawberry centers of the North) is approximately as follows:

Rent of land, two years	$11 00
Plowing and fitting	6 00
Plants	15 00
Setting plants	4 00
Cultivation	16 00
Straw for winter and fruiting mulch	15 00
Labor—hoeing, pulling weeds, etc	10 00
Total cost	$77 00

Many growers raise berries at a much less cost, and a few exceed this sum especially when located near a large town where rents are high; but it would be safe for one about to engage in Strawberry-growing to figure close to this total, aside from the cost of fertilizer.

2417. Heavy mulching of Strawberry plants, as practiced in parts of the North.

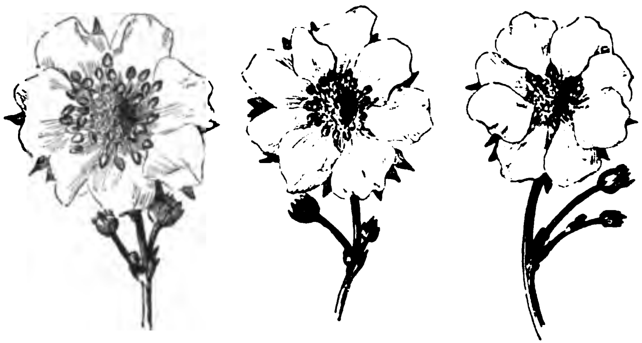
New varieties of Strawberries are raised from seed with the greatest ease. The generations of Strawberries are short and new varieties soon find favor. The varieties change so frequently in popular estimation that it is impracticable to recommend a list of them in a work like this. The first great American berry was the Hovey (Fig. 1088, Vol. II). Perhaps the most popular single variety has been the Wilson (Fig. 2420), now practically extinct. The accompanying pictures (Figs. 2421–2425) show types of American Strawberries.

The common garden Strawberries are the progeny of *Fragaria Chiloensis*, native to the Pacific coast of America, and first introduced to cultivation from Chile nearly 200 years ago. See *Fragaria*. In Europe the Alpine and Hautbois types of Strawberries (*F. vesca* and *F. moschata*) are highly prized as dessert fruits. These are sometimes grown in this country by amateurs, but they are unknown to commercial Strawberry culture. The native *Fragaria Virginiana*, everywhere common in fields in eastern North America, gives little promise under cultivation. It usually runs strongly to vine, at the expense of fruit-bearing.

There are several serious fungous diseases and insect pests of the Strawberry. The fundamental treatment for all these is to fruit the bed but once, or at most but twice, and to grow succeeding crops on other land, cleaning up the old plantation thoroughly after the last fruiting. Short, quick and sharp rotations and clean culture do much to keep all enemies in check. Most of the fungous enemies are kept in check with relative ease by spraying with Bordeaux mixture. Fig. 2426.

The American book writings on the Strawberry are: R. G. Pardee, "A Complete Manual of the Cultivation of the Strawberry," New York, 1854, and subsequent editions; A. S. Fuller, "The Illustrated Strawberry Culturist," New York, 1862, and subsequent editions; J. M. Merrick, Jr., "The Strawberry and its Culture," Boston, 1870; Charles Barnard, "The Strawberry Garden," Boston, 1871; T. B. Terry and A. I. Root, "How to Grow Strawberries," Medina, Ohio, 1890; L. J. Farmer, "Farmer on the Strawberry," Pulaski, N. Y., 1891. Aside from these writings, the Strawberry is well treated in various books devoted to small fruits and to fruit in general.

L. H. B.



2418. Sexes of Strawberry flowers.

At the left, a perfect flower; at the right, a pistillate flower (lacking stamens); in the middle, stamens few.

Culture of Strawberries. — [The following article was written for the Editor some ten years ago by the late J. M. Smith, Green Bay, Wis., long known as one of the most expert Strawberry-growers. It has never been published. Mr. Smith was born at Morristown, N. J., Jan. 13, 1820, and died at Green Bay, Feb. 20, 1894.—L. H. B.]

The Strawberry will grow and thrive in all parts of the United States where any fruit will grow, and yet, strange as it may seem to young readers, fifty years ago it was scarcely known except as a wild fruit. The writer has no recollection of ever seeing more than one small bed of Strawberries cultivated before he was 25 years old. In boyhood he often accompanied his father to the New York market, yet he never saw cultivated Strawberries in that market before 1840, though there were probably a few before that time. It is probable that there are now more Strawberries carried to New York every fair day during their season of ripening than had ever been seen in that city during its entire history previous to 1840.

The introduction of Hovey Seedling about 1834 or 1835, and of the Jersey, or, as it was sometimes called, the Early Scarlet, a few years later, marked a new era in Strawberry culture. These were great improvements over the common wild fruit previously seen in the market; but it was not until the introduction of the Wilson, about 1854, that it became possible for almost every one who owned a small plot of land to have a supply of berries for himself and friends during the berry season. This modest little plant completely revolutionized Strawberry growing. Its fruit was much larger than any other then in cultivation, being also very firm and able to bear transportation much better than any other, and it seemed to be perfectly at home in nearly every soil and climate from the Atlantic to the Pacific ocean, and from Lake Superior to the Gulf of Mexico. In addition to all these qualities, it was marvelously productive. Soon after this, new varieties began to appear in numbers greatly exceeding anything ever before known. This progress has been kept up until the present time, and each succeeding year many new varieties are brought to notice. The increase in the cultivation of this fruit was not rapid until 1855, when more attention began to be paid to it than ever before. Since the close of the Civil War the increase has been almost beyond belief, except to those who are familiar with its history.

2419. Strawberry nubbin.

Strawberry Soil. — If he could always choose, the writer would select a dark sandy loam, rather damp than dry, but this is by no means an absolute necessity, as Strawberries will grow in almost any soil, unless it be dry sand or an undrained bed of muck. Any soil that will grow a good crop of corn or potatoes will grow a fair crop of Strawberries. This remark will apply throughout the United States; and not only that, but Strawberries will grow in some places where the nights are too cool and the seasons are too short for corn to ripen. Hence but few need have any fears about their success on account of climate, latitude or longitude. The richer the soil the larger the crop, hence the necessity of making it rich by extra manuring.

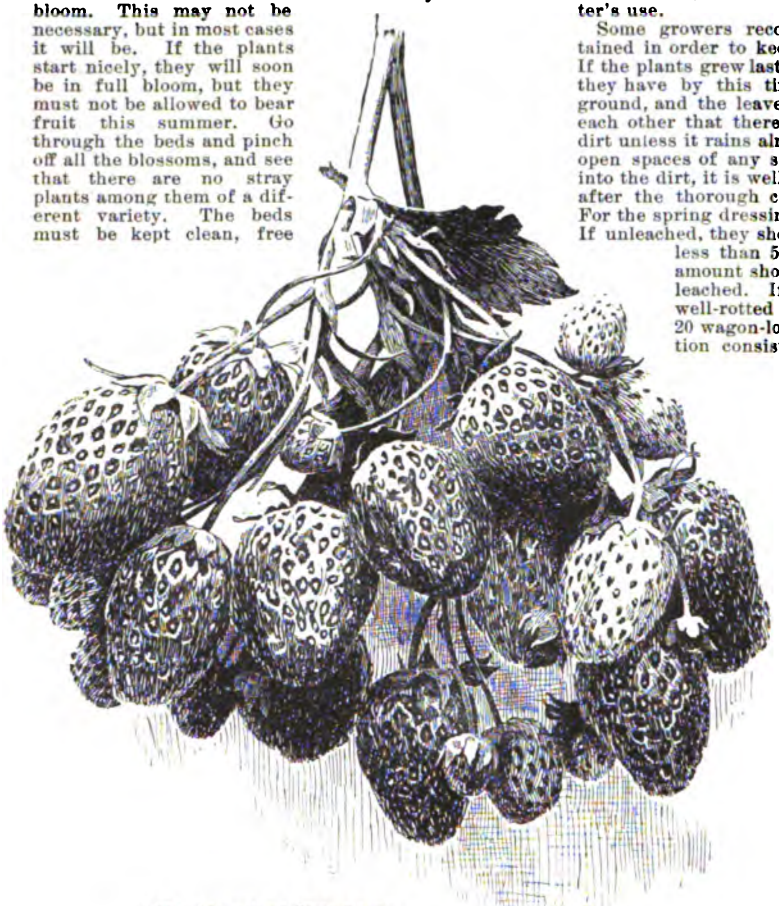
2420. Wilson Strawberry (× ⅓).

The first thing is to be sure that the land is thoroughly drained, as it is impossible to make Strawberries do even fairly well with the roots in land that is filled with water. Underdraining is not always a necessity, but good surface-draining is, and no land should be set with plants until it is so prepared that it can be thoroughly surface-drained and kept so. If the land is at all inclined to be wet, it will pay well to have it thoroughly underdrained, in addition to the surface-draining.

Next comes the preparation of the soil. The writer prefers spring setting. He has sometimes done well with setting in August or early in September, but has never failed in spring setting. As early as the land is fit to be worked, put on about twenty fair-sized two-horse loads of manure per acre and plow it in; then top-dress with as much more fine, well-rotted manure, and harrow it in thoroughly. If fine manure cannot be obtained, it would be better to plow all the manure under, as coarse manure on top of the beds would be an annoyance, and cause more or less trouble the entire season. Whether the manure is wholly or partially plowed under, the land must be made fine and mellow before putting in the plants.

2421. Gandy Strawberry (× ½).

Setting the Plants.—The plants should be taken from beds that were set the previous season, if possible. Use a common six-tined manure fork and take up a lot of the young plants, being sure to get only the runners of the previous fall. Pick them out of the loose earth, taking off all the old dry leaves, and if they have long, nice, light-colored roots (throw away all others), clip off about one-third of their length. Fig. 2414. Be careful not to let the sun shine on the roots for any length of time. During some of the hot sunny days of our spring weather, even ten minutes' exposure to the sun would damage them so much that one should hardly dare risk setting them out. Mark off the beds in rows two feet apart each way. For this we use a marker made just like the common hand hayrake with the headpiece of pine or some other light wood, and about 12 feet long, the teeth set two feet apart and sloping a little backwards instead of forwards as in the common hayrake. With this a man should mark an acre in a half day, and do it easily. If the ground is still a little heavy, as it is likely to be if it is a clay soil, let a man go ahead with a hoe and strike it into the earth where the plant is to be set and loosen it so that it will be perfectly mellow. A boy follows with the prepared plants, and drops one at each crossing of the marks. He is followed by the setters, of whom there should be two to work to best advantage. They go on their knees between two rows, pick up the plants with the left hand and at the same time, with the fingers of the same hand, spread the roots into a fan shape, while with the fingers of the right hand the ground is opened sufficiently to allow the fan-shaped roots of the plant to go down in a perpendicular manner into the earth; then bring back the earth around the plant and, doubling up both hands, press down the earth firmly around the newly set plant. The crown of the plant when set should be a very little lower than the surrounding earth. Be careful not to have the crown covered with earth, as that would damage it. All this can be done by men with a little experience in a small part of the time taken to write it out, but one must remember that the doing of this work well or ill will make the difference between success and partial failure. The writer has several men who will set half an acre a day, and do it easily and well. If the weather is dry and warm, it will greatly aid the young plants if half a pint of water is put around each one.



2422. Haverland Strawberry. (× ⅔.)

When the beds are filled with plants, run through them with a hand-cultivator before they come into bloom. This may not be necessary, but in most cases it will be. If the plants start nicely, they will soon be in full bloom, but they must not be allowed to bear fruit this summer. Go through the beds and pinch off all the blossoms, and see that there are no stray plants among them of a different variety. The beds must be kept clean, free from weeds, and well cultivated as often as they require it. In July the runners will start. Before the runners take root they should be trained around the parent plant like the spokes of a wheel, having the parent plant for its center. Simply lay them out in equal distances around the parent plant and throw sufficient earth upon them to hold them. Otherwise the runners are likely to come out on one side and make almost a solid mass of roots on that side and few or none on the other, the result being that the crop the following season will not be as large or of as good quality as when they have been properly tended. This is about all there is to be done until the ground freezes for winter, when the plants should be covered with marsh hay. Straw is as good, provided it is free from weeds and grass seed, but it is sometimes impossible to obtain such straw. In covering the plants, merely hide them from sight. There are two objects in view: first, to protect the plants from the many sudden changes in our winter weather, and, second, for spring protection. During the thawing days and freezing nights in the early spring, the ground is likely to become "honeycombed." The top of the ground is a little raised from its natural position, and the plants are lifted up and their roots broken off in the frozen earth beneath. To avoid this danger, leave the cover upon the plants until all freezing nights are over. Some growers recommend leaving the cover on and allowing the plants to work their way through it. The writer has tried this plan, but the crop was only half of that obtained when the cover had been taken off and the ground kept cultivated. Better take the cover off, haul it away and stack it for another winter's use.

Some growers recommend that the mulch be retained in order to keep the berries from being soiled. If the plants grew last season as they should have done, they have by this time nearly or quite covered the ground, and the leaves and fruit-stems will so support each other that there will be very few berries in the dirt unless it rains almost constantly. When there are open spaces of any size, and the fruit is likely to get into the dirt, it is well to put back a little of the mulch after the thorough cultivation of the spring is done. For the spring dressing, wood ashes are to be preferred. If unleached, they should be applied at the rate of not less than 50 bushels to the acre. Twice that amount should be used if the ashes have been leached. If ashes are not to be had, put on well-rotted stable manure at the rate of about 20 wagon-loads per acre. The spring cultivation consists of pulling out by hand all the weeds that can be found among the plants and then hoeing over all the open spaces large enough to accommodate a common broad hoe. Do not work the ground more than half an inch deep, for the roots have much work to do within the next few weeks.

Now it is time to begin to count the cost. We will consider the land worth $200 per acre:

Expense of an acre of Strawberries up to picking time.

Interest and taxes	$15 00
Plowing, harrowing and surface-draining	5 00
Value of 11,000 plants at $5 per 1,000	55 00
Manure, 60 loads, at $1 per load	60 00
Marking ground and setting plants	4 00
Summer cultivation	8 00
Training runners around the plants	3 00
Winter covering and cost of putting it on	6 00
Taking off winter cover, and spring cultivation	5 00
Total	$161 00

In a very dry and unpropitious year, the yield on the writer's place was 7,136 quarts, or 223 bushels per acre; the gross receipts in cash were a few cents over $500 per acre. In the year 1886 the yield was over 8,000 quarts, or something over 250 bushels per acre; and the gross receipts $633 per acre. These were both hard years for Strawberries. In 1875 exactly one-quarter of an acre yielded 3,571 quarts, or 111¼ bushels, of marketable fruit. The average price was 12 cents per quart. In 1876 one-fourth of an acre yielded a fraction less than 100 bushels. These were both favorable seasons for berries. But we will take the first mentioned crop for our estimate, as it was the poorest of the four. The boxes and crates cost a fraction less than $7 per 1,000 quarts; picking, packing and carrying to the depot not to exceed $15 per 1,000:

The story of an acre of Strawberries in an unfavorable season.

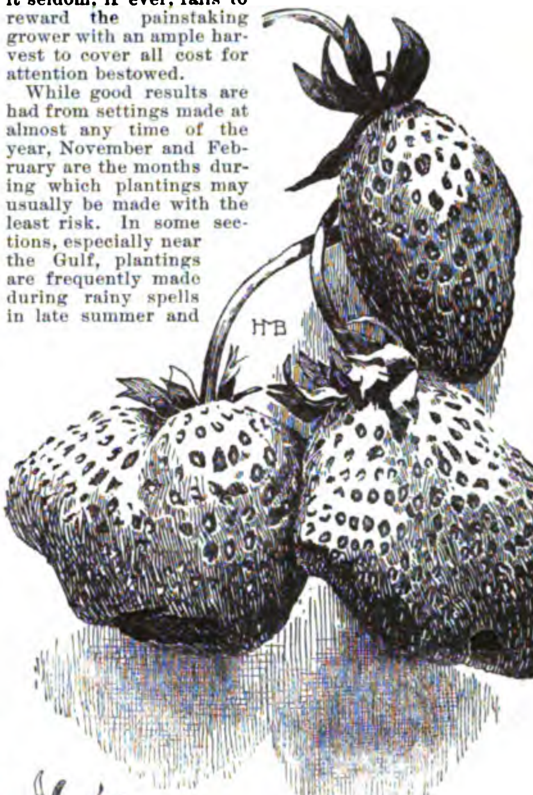
Gross receipts		$500 00
Cost of growing the crop	$161 00	
Picking, crating and marketing (7,136 qts.)	157 00	
		318 00
Net profits above expenses		$182 00

These receipts are by no means the only ones from the land for the two years. For many years past the writer has been in the habit of planting other early crops between the rows of Strawberries after they are set. For instance, in the spring a plot of five acres is set with Strawberries. As soon as the Strawberries are set plant between the rows (which are two feet apart) a large lot of onion sets and lettuce. One may sow part of the land with radish seed and another part with cabbage seed for late cabbage, and thus fill the ground with quick-growing plants that will be off before the runners need the ground.

Marketing.—A home market is the best if one can have it, although it is a well-known fact that but few Strawberries are eaten in the neighborhood where they are grown. Along the Gulf coast, Strawberries begin to ripen in February and are at once shipped north, and the consumption continues until 46° north latitude is reached; hence the necessity of a variety that will bear shipping. If we all had cooling-houses for berries, and refrigerator cars to ship the fruit in, almost any variety would bear more or less transportation; but as most growers have neither, the berries must be picked as soon as colored, and some varieties before they are fully colored. Before the writer had a cooling-house, he placed the cases in rows on the floor of a general packing house, and then placed ice along upon the floor between the cases. This did fairly well, but not as well as the present cooling-house, which is a very plain cheap building 12 x 14 ft. and about 12 ft. high. The sides are covered with common sheathing paper and boards, with an air chamber of four inches. The floor overhead is covered with zinc to prevent its leaking, and is a little sloping to one corner, where a pipe catches the water as the ice melts, and carries it from the building. It has an open space of nearly 12 inches all around the building, which lets the cold air pass below, where the fruit is. There are six tiers of shelves, one above the other all around the room below. Upon the floor above the ice is placed, and on the shelves below are the cases of fruit. About 50° is the best temperature to keep the fruit; if much lower than this, it is found that the fruit will not keep so long after being removed from the cooler. It is best not to throw fruit on the market, but to try to have it so good that it recommends itself. Endeavor to have it engaged to the retail grocers in advance. Then there is but one profit between the consumer and the grower.

J. M. Smith.

Strawberry Culture in the South.—If any fruit is at home in the South it is surely the Strawberry. It heads the list of small fruits, and, admitting as competitors tree and vine fruits, it easily holds the place of first importance. Among the many things that commend the Strawberry favorably to southern land-owners who would grow fruit for home use or for market are the following: its comparative freedom from disease and insect enemies; the ease with which it adapts itself to different soils and varied conditions of climate; the small cost attending planting and cultivation; the enormous yields possible from well-selected soils properly treated; and the fact that, aside from being the first fruit to ripen, it seldom, if ever, fails to reward the painstaking grower with an ample harvest to cover all cost for attention bestowed.



2424. Belmont Strawberry. Natural size.

2423. Bomba Strawberry. Nearly natural size.

While good results are had from settings made at almost any time of the year, November and February are the months during which plantings may usually be made with the least risk. In some sections, especially near the Gulf, plantings are frequently made during rainy spells in late summer and early fall At such times it is neither a difficult nor a very expensive process to shift plants with earth adhering to the roots to nicely prepared soil near the old beds. From good stands on newly prepared beds secured as early in the season as August or September, and with a long fall and mild spells during winter favoring vigorous plant growth and development of fruit-buds, the grower may reasonably expect the following spring one-half to two-thirds of a crop.

Being a water-loving plant and a liberal feeder, especially during fruiting season, the Strawberry accomplishes its best work in a soil capable of taking in the largest quantity of water and of holding during protracted drought the greatest amount of moisture within easy reach of the plant. This ideal Strawberry soil is found in the rather compact deep clay loams over the well-drained clay subsoils so abundant in most of the South Atlantic and the Gulf states.

As to fertilizers, much depends on the kind of soil and treatment. Where the cereals are benefited by the use of certain fertilizers, such plant-food may be safely and profitably used for Strawberries. It is better to fertilize heavily the crop that precedes Strawberries than to apply in large quantities to land occupied by this plant. In no case should heavy applications of strongly nitrogenous fertilizers be made just before the blooming period nor during the hot summer months. In the first instance, an over-vigorous vine growth at the expense of fruit will be the result; in the second, the plant is rendered too tender and too sappy to resist the long and sometimes hot and dry summers. The southern cow-pea is possibly the best crop to precede the Strawberry. This leaves the ground clean, mellow and in the very best condition for any crop that follows.

2425. Shuster Gem Strawberry (× ½).

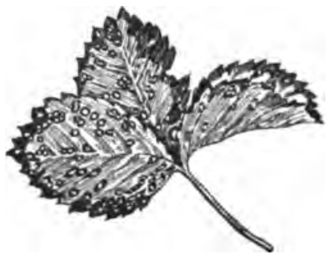
The soil is usually prepared in slightly elevated rows or beds 3½–4 feet broad. In making summer and early fall plantings with the view of securing a large yield the following spring, plants are set only 8 or 10 inches apart along the line of the row. The distance in the row for spring plantings ranges from 12–30 inches, depending on the tendency of varieties set to multiply runners. For heavy yields the properly matted row is best. In the ideal matted row each plant should be 5–7 inches distant from its nearest neighbor, and a space of 18–24 inches along the top of the rows should be so occupied with plants. Season, soil and treatment at the hand of the cultivator greatly modifies the degree of success in securing this ideal stand. Where irrigating facilities are to be had, the desired results may be obtained with certainty. In spite of the best efforts on the part of the grower, however, varieties like Michel, Downing and Cloud may set too many plants during wet seasons. In such cases any runners that encroach on the spaces between rows are treated as weeds, and such places along the line of the rows as become too thickly matted should be properly thinned on the advent of cool fall weather.

With spring setting, cultivation begins shortly after plantings are made. The plow, cultivator and hoe are the implements most used, and these are employed in cultivation often enough to keep the ground in good tilth and free from weeds. Cultivation usually ceases early in the fall. Any weeds that interfere with the proper development of plants or fruits from this time until the end of fruit harvest are pulled out or clipped off with sharp hoes without breaking the surface soil. Very little winter protection is necessary. It is well to delay mulching until after midwinter, or until there has been sufficient cold to drive insects into winter quarters. On clay soils inclined to heave during frosty weather a thin covering of barnyard litter or of short straw (pine straw is excellent) placed around and between rather than over plants is of advantage. For keeping fruit clean and, at the same time, adding almost, if not quite, its purchase value in plant-food, nothing is better than cottonseed hulls. It is a fact worthy of note that as one goes south the picking season lengthens. Florida, southern Louisiana and other sections near the Gulf frequently begin shipping late in January or early in February and continue to market berries for four or five months. In latitude 32° the writer has during several seasons in the past twenty-five years shipped Strawberries from about April 1 to July 1. In latitude 34° the picking season rarely lasts more than five or six weeks.

In recent years the rapid strides made in methods of picking and packing, in the construction, loading and icing of fruit cars, in shortening the time between grower and consumer, and in vastly better means of distributing fruits among different markets and of reaching all classes of consumers in the several markets, —all these things have made southern-grown Strawberries common in almost every city, town and village in more northern latitudes. A. B. McKay.

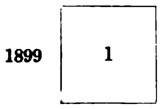
To the foregoing advice may be added a sketch of some of the rotation practices in Georgia. Four systems of rotation exist: the annual, biennial, triennial, and what may be termed the perennial or permanent system. These terms are frequently, though quite unnecessarily, confused, and some growers, while practicing, technically, a biennial rotation, call it annual, because they establish a new plat annually, although each plat, when plowed under or destroyed, is two years old.

To illustrate: A plat planted in July, August or September makes a good, strong growth by winter along the isotherm of the Carolina and Georgia coast, where summer planting and the system of annual rotation are almost exclusively practiced. In fact, the plant continues to grow, especially under ground, through the entire winter, setting in the spring a heavy and profitable crop, which is marketed. The plat is seldom worked out, but used to reset another plat in the late summer, and then turned under. Such a rotation is strictly an annual one. Logically, it could be nothing less, nothing more. If, however, this plat were cultivated through the season following its crop, suffered to bear a second crop the next spring, then used as before to reset a succession plat and turned under, such a process would be a biennial rotation, and, logically, could be nothing less, nothing more. Equally as logical would it be to call the rotation biennial had the plat been planted in November—instead of July, August or September — cultivated through the following summer and carried into the next year, bearing its main crop—its "money" crop—the second spring. The fact that its first crop was light and scattering would not make the rotation an annual one; for the essence of the difference between an annual and a biennial rotation consists in the plat, in the first instance, flowering but once, while in the second instance it passes two flowering seasons. In the first case, no cultivation is given after fruiting; in the second the plat is cultivated after fruiting, or after the fruiting season, whether it fruits or not. These two distinctions cause a rotation to fall under the head of biennial even when the plat is set out as late as February or March, cultivated through the summer following and fruited the next spring.

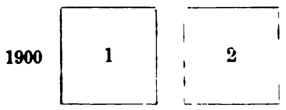

2426. Leaf-blight of Strawberry (× ⅙).

The biennial rotation (though often under the erroneous title of annual) is much the most common, and is almost universally employed, except on the coast, where the light, sandy soil, the humid climate and more regular rainfall render summer planting on a large scale an economic possibility. This, the stiff clay soil of the interior, the drier atmosphere and uncertain rainfall of early autumn, render impracticable. It is hence more economical to reset than to cultivate on the coast, especially as its comparatively subtropical climatic conditions tend to produce a vigorous development of the summer- or fall-planted plat by the following spring. But, while the biennial rotation is recommended for the interior of the state, it must not be understood that a new plat is to be established only every two years. The plat runs through two seasons, it is true, but a new one must be set out each year.

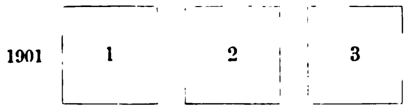
If strawberry growing was commenced in 1899 under a biennial rotation, and the planting effected in November of each year, the following diagram would illustrate the necessary succession of plats:



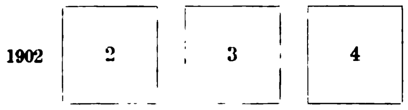
No. 1, planted November, 1899.



No. 1, fruited lightly spring, 1900; cultivated through season of 1900.
No. 2, planted November, 1900, from new purchased plants.



No. 1, fruited main crop, spring, 1901; plowed under November, 1901, after resetting No. 3.
No. 2, fruited lightly spring, 1901; cultivated through season of 1901.
No. 3, planted November, 1901, from runners of No. 1.



No. 2, fruited main crop, spring, 1902; plowed under November, 1902, after resetting No. 4.
No. 3, fruited lightly, spring, 1902, and cultivated through season.
No. 4, planted November, 1902, from runners of No. 2.

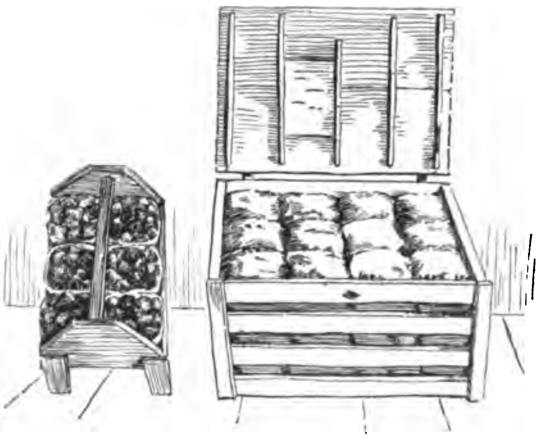
And so on, indefinitely. In this way, while each plat runs two years, that is, biennially, a new plat is reset every year, that is, annually; yet the rotation must of necessity be termed biennial, though only one marketable crop results. And this would be equally true for a similar rotation where the planting was done in February or March instead of November, although no crop—not even a light one—could be obtained the same spring. Of course, if a plat is reserved for resetting, after it has borne its main crop, it must be cultivated, more or less—at least by hand weeding—to prevent it from becoming too foul during the second summer; but the process of thinning out and the careful cultivation necessary for a crop expected to make a paying return in fruit, are eliminated.

The triennial rotation is followed when two "main" or "money" crops are secured from a plat before its abandonment, and the perennial system when the plat is suffered to bear as long as it proves profitable.

The "matted row" system stands successfully the test of practical experience in the South. "Stool culture," however perfect or ideal in theory, can be made profitable only under exceptional conditions. Under ordinary circumstances it cannot resist the crucial test of a prolonged drought.

H. N. Starnes.

Strawberry Culture on the Plains. — The fact that the Strawberry has been growing wild from time out of mind in the prairie regions of North America suggests that it may be cultivated there with success, and the thousands of car-loads of delicious berries annually produced in those regions are positive proof of it. The Strawberry did not grow naturally in all sections or soils, but chiefly in the moist creek and river bottoms and along the margins of the woodlands. The cooler climatic conditions of the northern sections are more conducive to the growth of wild Strawberries than those in the South; for instance, the prairies of Minnesota grow more thrifty and larger berries than those of Texas. Under cultivation the Strawberry is somewhat subject to the same conditions as when growing naturally, but the principle of conservation of moisture by tillage has enabled man to do much that nature could not, in growing Strawberries. Water is most essential in the culture of this fruit. The soil should not be wet, but it must be moist or the plants will not thrive; nor will they bear fruit abundantly or of good size and quality with a meager supply of water. During the fruiting season there is a heavy draft upon the plants for water with which to fill the berries to their proper size. Over most of the Plains region there is a sufficient amount of rainfall to produce good crops of Strawberries in ordinary seasons, provided proper care be given to tillage. Nearly all the failures to grow reasonably good crops are due to neglect of this all-important matter. The drier the climate or the season the more heed should be given to tillage.



2427. Fancy packing of Strawberries, each quart wrapped in paper; a picking stand on the left.

The mere setting of plants and giving them ordinary care is not sufficient for the production of a really profitable Strawberry crop in the open prairie country. It may suffice where the rainfall is not only abundant but regular; but where the rains are fitful and often very scant, especially in the latter part of the summer, this will not do. The tillage should not be deep, but very frequent. Once each week during the growing season will be sufficient. The finer the surface soil is pulverized, the less water will escape from the subsoil, and this is the principal point to be attained so far as the purposes of tillage are concerned. Rich soil is beyond doubt one of the prime requisites of Strawberry culture. This is not difficult to find in most parts of the prairie regions. Some of it lies too flat for the best results and some is too steep, but very little is either too stiff or too sandy.

The Strawberry is especially adapted to field culture. As the Plains country slopes up to the Rocky Mountains the climate becomes drier until there is so very little rain that nothing but a scant native vegetation will grow without irrigation. The soil is for the most part rich enough for Strawberries, and where water is applied in proper quantity as fine berries can be grown as in any part of the humid regions. As a matter of fact, there seems to be more certainty in growing Strawberries under such conditions than in regions where the crop must depend upon rainfall. Some varieties that are usually a failure because of their deficient root-system, such as Jucunda, are thus enabled to flourish to such a degree as to be among the most profitable. Whatever may be said of other parts of the continent of North America, it is an indisputable fact that the Plains region is very good for Strawberries. Good judgment in the selection of proper locations and the right varieties, thorough preparation of the soil and good culture will be abundantly rewarded. H. E. Van Deman.

The Strawberry on the Pacific Coast. – California conditions include both those most favorable and most trying for the growth of Strawberries. There are situations where, through local topography and proximity to the ocean, winter temperatures are very seldom too low for the growth and fruiting of the plants and where, by summer irrigation to maintain this continuous activity of the plants, it is possible to gather fruit every month in the year. This fact is not, however, made of much commercial account, nor is it widely true that one can have Strawberries all the year round in the open air. It is true, however, that even on the lowlands, where the commercial crops are chiefly grown, the winter is so mild that Strawberries begin to ripen in shipping quantities as early as March and by proper cultivation and irrigation the fruiting is continued until late in thè autumn, and the grower has therefore a very short closed season. The trying condition for the Strawberry is found in the long, dry summer, which enforces dormancy as early as June on light loams in the more arid localities of the interior. Such soils become dry and hot to a depth of several inches in spite of surface cultivation and cause the dwindling and death of a shallow-rooting plant like the Strawberry, unless frequent irrigation is begun in time. This trouble is less acute on more retentive soils in regions of lower summer temperature and greater rainfall, and plants in such situations may survive the summer dormancy, but it is true that everywhere in California and even in the more humid states on the north that Strawberry-growing without irrigation results either in failure or only partial satisfaction and the venture is seldom to be commended. It is, however, so easy, usually, to secure the small amount of water necessary for home production, and the plant when fairly treated is so highly productive, that a general exhortation to Strawberry-growing on an irrigation basis is fully warranted.

2428. A prolific row of Strawberries, the fruit resting on a mulch.

There are several species of Strawberries indigenous to California, and they are of both littoral and alpine types. Some interest has been shown in development of cultural varieties from these sources, but no commercial significance has as yet attached to them. The varieties chiefly grown are different from those popular at the East. New varieties from the eastern states and from Europe are freely tried, but few are successful and they retain local popularity after abandonment in their birthplaces. A striking instance of this fact is the continued popularity of Longworth Prolific, Sharpless, Monarch of the West, Wilson Albany, etc. Longworth has survived more than thirty years' continued growing. Other popular varieties are Melinda, Jessie, Triomphe de Gand, Brandywine, Marshall, Lady Thompson, etc. An English variety, Laxton Noble, has been largely planted in southern California but not always successfully, though it does well near the coast. The Arizona Everbearing is par excellence drought- and heat-resistant and is constantly increasing its area in interior situations. It has endured neglect which has actually compassed the death of other varieties. The Australian Crimson is a popular market variety in southern California, of which the first plants came from the southern hemisphere, but it has some appearances of being a re-named American variety.

2429. Strawberry field in Wisconsin.

The growth of Strawberries is almost wholly in matted rows, the rows usually occupying low ridges only sufficiently elevated to allow the slightly depressed intervals to serve as irrigation ditches and as walks during picking. The slight elevation of the plants also assists in surface drainage, when heavy rains fall during the early part of the fruiting season, and this promotes early growth and fruiting of the plants. Where the soil is too coarse to permit free rise of water from the depressed ditches the conditions are reversed and low levees are made to inclose blocks of plants which are irrigated by flooding the inclosures. In the chief commercial regions a fine loam is used and irrigation from the small ditches on both sides of the ridges, which are about 2 feet wide, is the ruling method. Nearly level land is selected and grading is done before planting to reduce dry knolls and fill low places so that the water will flow slowly and will evenly moisten the whole field. Subirrigation by tile has been often advocated but never has been employed to any extent.

One of the chief Strawberry-shipping districts in central California is characterized by a shallow loam underlaid by an impervious indurated clay or hard pan, which prevents the percolation of the irrigation water and enables growers to maintain a large acreage by means of the small water supply secured by windmills. In this case water is applied very frequently, even oftener than once a week in some cases, but the total amount for the season is small. Quite in contrast to this is the growth on light, deep loams where water sinks so rapidly that the plants suffer, although water is almost constantly running in the ditches. In such cases mulching and sprinkling are the price of success, and these are too costly except on a small scale for home supply. The largest producing districts have soils midway between the extremes above noted; viz., deep, retentive loams, situated rather low in the valleys and with irrigation available either by ditch system or by wells both flowing and pumped. The pump wells require usually only a short lift, and abundant water is secured cheaply by the use of modern pumps and motors.

In addition to supplying the home markets, which are very good, California Strawberry-growers find a good outlet for the fruit all through the region west of the Missouri river. Southern California supplies the southern portion of this district, while the growers in central California, chiefly near Florin in Sacramento county, make large shipments eastward as far as Colorado and northward to all the great interior states and to Oregon, Washington and British Columbia before the locally grown fruit in those regions is available.

2430. The forcing of Strawberries under glass.

The states of Oregon and Washington in their areas lying west of the Cascade mountains have conditions excellently suited to the growth of the Strawberry. Their conditions more nearly resemble those in the eastern states than any other part of the coast. The cooler weather and more abundant moisture give a better spring season than that of California, but the season is on the whole much shorter because of the longer winter. Irrigation is also necessary in most places for continued fruiting during the summer. The most famous district is Hood River, Oregon, where arid conditions east of the Cascade mountains are modified by western influences which reach through the gap in these mountains where the Columbia river flows through. Irrigation is regularly employed and a large commercial product grown. The varieties chiefly grown in this region and in adjacent parts of Washington and Idaho are of local origin, the Hood River (Clark Seedling) and Magoon Seedling being widely approved. Jessie, Sharpless, Wilson, Haverland, Crescent, Cumberland, Jucunda and Parker Earle are also commended by growers in the northwestern states.

E. J. Wickson.

The Forcing of Strawberries for a Winter Crop has not as yet become of any great commercial importance in North America. Some gardeners grow a few potted plants for either Christmas or Easter decoration. Very few, if any, commercial growers are forcing Strawberries exclusively to any profitable extent. The few Strawberries that are forced are grown either in pots or planted out on benches. The former method is the one generally employed. There are several good reasons for this, some of which are: first, the confinement of the roots; second, the ability to ripen the crowns in the fall; third, the control of fertilizers and liquid manure; fourth, the privilege of having the crop grown in several houses at one time or brought from a coolhouse into heat; and fifth, the opportunity to supply particular demand of the potted plants or their fruits. The first expense of the pot method is considerably more than when the plants are grown in the benches, but after the pots are once purchased the cost of each method should be about the same.

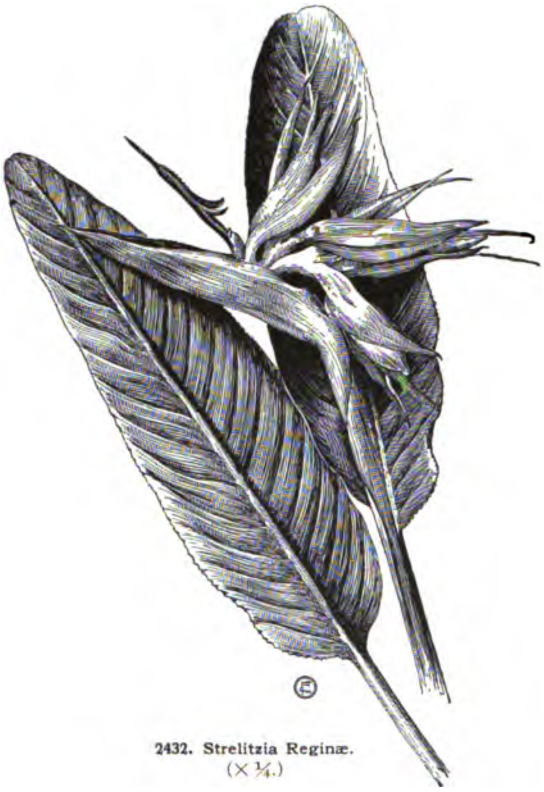
The pot method as practiced at Cornell University is about as follows: As early in the spring as possible large plants are set in well-enriched soil. The first strong runners made by these plants are secured and potted. Numerous 2- or 3-inch pots filled with good soil are plunged to the rim along the Strawberry row. The runners are trained to these pots, and a small stone is placed on each runner to keep it from growing beyond the pot. When the pot is filled with roots the young plant is cut from the parent stock, the pots lifted and taken to the potting shed or other convenient place, where they are at once shifted into the fruiting pots (usually a 6-inch pot). The soil used at this time should be three parts fibrous loam and one of good sharp sand. This potting soil should have mixed with it bone-flour or dissolved rock at the rate of about one pint to two bushels of soil. Ample drainage should be given, as through the season of ripening the crowns and the following forcing period a large quantity of water must be given and none should be allowed to stand around the roots.

The pots should then be plunged to near the rim in some coarse material, preferably coal ashes, which, if deep enough to extend from four to six inches below the plunged pots, will prevent the earthworms from entering the pots. The use of a frame in which to plunge the pots is recommended for protection against heavy rains or early frosts. Attention to watering is all that will be necessary through the growing season. Late in September or early in October the pots will be filled with roots and the plants will have attained their full growth. At this time larger and firmer crowns will be had by careful attention to watering and subsequent drying off to almost the wilting stage than by watering the plants up to the time of freezing weather. The drying process seems to represent the late fall season and causes the plant to store up material in the crowns at an earlier period. At the coming of cold weather the soil in the pots may be allowed to freeze. It is very desirable that the soil be on the dry side before freezing, for if the ball of earth is wet there is danger of breaking the pots when the cold becomes intense. The period of forcing from the time the frozen plants are brought in until the ripening of the fruits will be about eight weeks. The time will vary slightly under different conditions of heat and sunlight. When first brought in, the plants should be cleaned of all dead or diseased leaves. The pots should be plunged to near the rim in some material that will retain moisture, e. g., tan bark or coal ashes. The benches or shelves should be as near the glass as convenient. A thorough spraying with Bordeaux mixture or some other fungicide should be made at once. For the first few days the house should be held at about 35°, with little if any rise through the day. After a week a rise of 10° may be given. At the end of the second week 50° at night, with a rise of 10–15° through the day, will be about right.

2431. A good winter Strawberry plant in bloom.

Strict attention must be given to syringing the foliage every pleasant day. Keep the walks wet until the time of blossoming. This moisture keeps down the red spider. At blossoming time the house should be allowed to dry out, and a free circulation of air should be maintained through the middle of the day, in order to ripen the pollen. It is necessary to pollinate each flower by hand. The pollination may be done in the middle of the day while the houses are dry. A small camel-hair brush is useful for distributing the pollen. A ladle or spoon should also be provided in order to carry the surplus pollen. The surplus pollen may be used on varieties that are pistillate or do not have pollen enough to set their own fruits. Six to eight fruits are enough for a 6-inch pot. When these are set the remaining flowers should be cut off, in order that the entire strength of the plant may go to swelling the chosen fruits. After swelling begins, liquid manure should be given. During the first week give one dilute application. After this give two applications a week, increasing the strength of the manure liquid each time. Well-rotted cow manure or sheep droppings furnish good material for this purpose. When the fruits are coloring the liquid manure should be withheld and only clear water given. As they swell, the fruits will need support, and the best method of furnishing this is probably by using small-meshed window-screen wire cut into suitable squares. These squares may be laid on the pot, under the clusters of fruits. They hold the fruits away from the sides of the pots, protect them from any water or liquid manure that is given the plants, and enhance the beauty of the potted plant. After one fruiting, the plants are worthless.

C. E. Hunn.



2432. Strelitzia Reginæ. (× ¼.)

STRAWBERRY BUSH. See *Euonymus.*

STRAWBERRY GERANIUM. *Saxifraga sarmentosa.*

STRAWBERRY-RASPBERRY. *Rubus rosæfolius.*

STRAWBERRY TOMATO. *Physalis Alkekengi* and other species of *Physalis.*

STRAWBERRY TREE. *Arbutus Unedo.*

STRELÍTZIA (after the wife of King George III, Charlotte Sophia, of the family Mecklinburgh-Strelitz, a patron of botany). *Scitaminàceæ.* Bird of Paradise Flower. A South African genus of 4 or 5 species of perennial herbs, with generally large, long-petioled leaves and showy flowers of peculiar form: rhizome subterranean or produced into a large woody stem: pedicels short: spathe long or short, peduncled.

Strelitzia Reginæ requires a good strong soil, a copious supply of water and considerable sunlight. It is a serviceable plant for house decoration or for the porch or lawn in summer. It will endure much neglect, but unless well cared for it may fail to bloom regularly and well. A night temperature of 50° is sufficient. This plant may be induced to set seed if the flowers are hand-fertilized.

A. *Plant nearly stemless.*

Reginæ, Banks. Bird of Paradise Flower. Fig. 2432. About 3 ft. high: roots large, strong-growing: lvs. oblong, about 1 ft. long, stiff, concave; leaf-stalks all radical, twice to three times as long as the lvs.: scape higher than the lvs.: spathe about 6 in. long, nearly horizontal, purplish at the base, about 6-fid., the fls. orange and blue-purple. Winter. B.M. 119, 120.

AA. *Plant with woody stems.*

B. *Fls. pure white.*

Augústa, Thunb. (*S. angústa,* D. Dietr.). Becoming 18 ft. high: lvs. at the summit of the stem, 2–3 ft. long, oblong, acute; petiole 4–6 ft. long: peduncle short, from a leaf-axil: spathe deep purple: fls. on short purple pedicels, all parts of the flower pure white; petals round at the base. B.M. 4167, 4168.

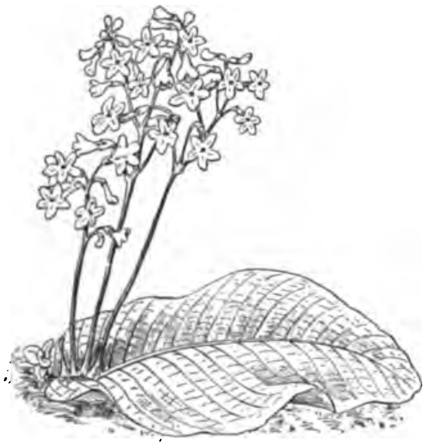
BB. *Fls. pale blue and white.*

Nicolai, Regel & C. Koch. Resembling *S. Augusta* in habit and foliage, but the fls. and spathe are much larger and the petals are hastately combined and blue in color. B.M. 7038.

F. W. Barclay.

STREPTOCÀLYX (*twisted calyx*). *Bromeliàceæ.* There are 7 species of Streptocalyx according to Mez (DC. Monogr. Phaner. Vol. 9) of Brazil. The genus differs from Bromelia in having strongly imbricated broad sepals and long corolla-tube. No species are in the American trade, but *S. Fürstenbergii,* Morr., is described in horticultural literature (sometimes as *Æchmea Fürstenbergii,* Morr. & Wittm.). It is a stemless pineapple-like plant, with 30–40 rigid lanceolate leaves in a dense rosette: cluster a central dense panicle 1–1¼ ft. long, with many 2-sided spikes of rather dull flowers.

STREPTOCÁRPUS (Greek compound, meaning *twisted fruit*). *Gesneràceæ.* Cape Primrose. In October, 1826, there bloomed at Kew a most interesting gloxinia-like little plant, seeds and specimens of which had been collected in South Africa by Bowie, on the estate of George Rex, at Knysna. The plant was described as *Didymocarpus Rexii.* It is a stemless plant, with one, or rarely two, long-tubular nodding pale blue flowers on each of several short scapes, and with several clustered root-leaves. It proved to be a profuse bloomer and easy to grow. "So abundantly does it produce seed," wrote W. J. Hooker, in 1830, "that new individuals come up as weeds in the neighboring pots, and a succession of flowers may be obtained at almost every period of the year." In 1828, John Lindley made the genus Streptocarpus for this plant, calling it *S. Rexii,* the name it now bears. It appears to have been nearly thirty years after the introduction of *S. Rexii* that another Streptocarpus bloomed in England. This second species was *S. polyantha,* which may be taken as the type of a group that has one leaf lying on the ground and from the midrib of which arise successive several-flowered scapes. The introduction of this curious plant seems to have revived the interest in Streptocarpuses, an interest that has been kept alive by the frequent introduction of other species. The chief stimulus to the systematic breeding of these plants seems to have been the introduction of *S. Dunnii*, said by J. D. Hooker to be "quite the monarch of its beautiful genus" (but now excelled by *S. Wendlandii*). Seeds of this species were sent to Kew in 1884 by E. G. Dunn, of Cape Town. It is one of the monophyllous section to which *S. polyantha* belongs. In the meantime, *S. parviflora*, a species allied to *S. Rexii*, had been introduced from the Cape region. With the three species, *S. Rexii*, *S. parviflora* and *S. Dunnii*, W. Watson, of the Royal Gardens, Kew, set to work systematically to breed a new race of Streptocarpus, and his efforts met with unqualified success. When the hybrids came to notice in 1887, the Gardener's Chronicle made the following comment on the value of the work: "The results are very striking, and we can hardly doubt that Mr. Watson has set the foundation of a new race of plants, parallel in importance to the Achimenes and Tydæas." Several hybrid races have now been produced and several interesting species have been introduced from the wild, so that Streptocarpus seems to be destined to become a very important and popular garden genus.



2433. Streptocarpus Wendlandii (× ⅛).

Bentham and Hooker's treatment divides the Gesneraceæ into two great tribes: Gesnereæ, with ovary more or less inferior and fruit a capsule; Cyrtandreæ, with ovary superior and fruit sometimes a berry. The latter tribe, the species of which have been monographed by C. B. Clarke in vol. 5 of DeCandolle's "Monographiæ Phanerogamarum," contains the genera Streptocarpus, Episcea, Cyrtandra, Æschynanthus, Ramonda, and others. The Streptocarpuses are stemless or nearly stemless herbs, bearing 1 or more tubular nodding fls. on short scapes that arise either from the crown of the plant or from the midrib of a flat prostrate leaf: corolla-tube cylindric, the limb 5-lobed and somewhat 2-lipped; perfect stamens 2, included; pistils with ovary linear, usually hairy, with style as long as or shorter than the ovary, and stigma capitate or indistinctly 2-lobed: fr. a linear 2-valved capsule, the valves twisting. The flowers are usually showy, blue or lilac, rarely yellow. The species are of three groups: the stemless monophyllous species, with one prostrate leaf from the midrib of which the scapes arise (this leaf is really an enlarged cotyledon, the other cotyledon not enlarging); the stemless species, with several or many radical more or less primula-like leaves (whence the English name "Cape Primrose"); the stem-bearing species, with opposite cauline leaves. The cultivated species chiefly represent the first two sections. In the American trade, only four specific names occur, *S. Rexii*, *S. Galpini*, *S. Dunnii*, and *S. Wendlandii;* but since the hybrids represent several other species, these additional species are inserted in the following account. Streptocarpus is an African genus. The stem-bearing section is confined to central Africa and Madagascar, and the others to South Africa. Clarke's Monograph, 1883, describes 19 species, but *S. Dunnii*, *S. Wendlandii*, *S. Galpini* and others have since been discovered. There are 25–30 known species.

Streptocarpuses are not difficult plants to grow. They are usually raised from seeds, the seedlings blooming in 8 to 15 months from starting. The seeds are very small, and care must be taken not to cover them too deep. Give an open sunny place in an intermediate temperature. They are not stove or warmhouse plants. Of the new hybrid forms, seeds sown in February or March should produce plants that will bloom the following fall and winter; after blooming, the plants may be discarded, for better results are usually secured from new plants than from those more than one season old. The season of most profuse bloom is summer, but the bloom continues until winter. The monophyllous species can be propagated also by cuttings of the leaf. Some fanciers of Cape Primroses advise propagating select types by leaf cuttings or by division.

A. *Streptocarpus species, or those forms introduced from the wild.*

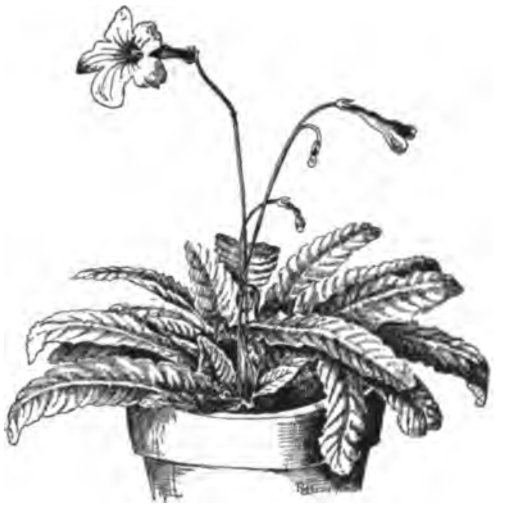
B. *Leaf one, prostrate on the ground, usually very large.*

C. *Fls. red.*

Dúnnii, Hook. f. Soft-hairy: leaf becoming 3 ft. or even more in length and 16 in. wide, thick-nerved, reddish tomentose beneath, rounded at base, obtuse at apex, coarsely toothed: scapes several to many, in a row beginning at the base of the leaf, erect, 1–3 ft. tall, many-fld.: corolla long-tubular, curved, 1½ in. long, the limb narrow, bright rose-red. Transvaal. B.M. 6903. G.F. 3:609.—A very floriferous species, one plant sometimes bearing more than 100 flowers.

CC. *Fls. blue, mauve or lilac.*

Saúndersii, Hook. Hairy: leaf 1 ft. by 9 in., cordate, obtuse, coarsely serrate, yellowish green above and purple-rose beneath: scapes 10–16 in. tall, bearing a compound cyme of large drooping blossoms: corolla 1–1½ in. long, funnelform, the limb broad but not equaling the nearly straight tube, light blue, with 2 purple spots in the throat. Natal. B.M. 5251. F.S. 17:1802.—Named for W. Wilson Saunders, through whom it was introduced.



2434. Streptocarpus Rexii (× ⅛).

polyántha, Hook. Hairy: as compared with *S. Saundersii*, the leaf is smaller and the fls. bluer and borne in a compound racemose panicle: corolla-tube curved, shorter than the large, wide-spreading toothed pale blue limb. Natal, Orange Colony. B.M. 4850.

Gálpini, Hook. f. Hairy: leaf ovate-oblong, obtuse, entire: scapes several to many, glandular-pubescent: fls. short and broad, being nearly or quite bell-shaped, the limb broad and subequal, rich mauve, with a white eye. Transvaal. B.M. 7230. G.C. III. 11:139.—Named for Ernest E. Galpin, who discovered the plant.

Wéndlandii, Damman. Fig. 2433. Hairy, usually bearing a rosette of very small lvs. at the base of the radical one: leaf broad, often becoming 24 x 30 in., sometimes narrower, rounded at both ends, crenate-undulate, red-purple beneath: scapes several, forking, bearing paniculate racemes: corolla-tube about 1 in. long, curved, pubescent, the limb large and oblique, with broad entire lobes, the whole effect violet-blue and whitish. Transvaal, Natal. B.M. 7447 (part of which is copied in Fig. 2433). G.C. III. 22:275. Gn. 45, p. 511; 50, p. 394. J.H. III. 28:223.—Probably the finest species yet introduced.

BB. *Leaves several, rising from the crown.*

Rexii, Lindl. Fig. 2434. Hairy: lvs. ovate-oblong, 6–9 in. long, short-stalked, obtuse, crenate: scapes several, 3–8 in. tall, 1-fld. or rarely 2-fld.: fls. 2 in. long, 2–3 in. wide, the tube downy and nearly white, the large spreading limb pale blue to purple. S. Afr. B.R. 14:1173. B.M. 3005. L.B.C. 14:1305.

parviflòra, E. Mey. Soft-hairy all over except the corolla: lvs. ovate, obtuse, sessile or nearly so, crenate, appressed to the ground: scapes several, 6–10 in. tall, reddish, bearing corymbose racemes: fls. small, the corolla-tube about ⅜ in. long and purplish and curved, the spreading broad limb nearly white and with orbicular lobes. Cape. B.M. 7036.

2435. Streptocarpus Kewensis (× ⅓).

lùtea, Clarke. Lvs. erect and elongate-oblong: fls smaller and usually fewer, yellowish, the corolla-lobes narrower and the tube relatively broader. Transvaal. B.M. 6636 (as *S. parviflora*).—Perhaps only a form of *S. parviflora*. The two species were confused until separated by Clarke in 1883. It appears that this plant, rather than the true *S. parviflora*, was one of the parents of the hybrid *S. Watsoni* (see W. Watson, G.F. 3, p. 609).

AA. *Streptocarpus hybrids, of garden origin.* (For colored pictures of modern hybrid types, see Gn. 29:545; 41:843; 50:1092.)

Kewénsis (*S. Rexii*×pollen of *S. Dunnii*). Fig. 2435. "It has two or three large oblong or elongate-ovate bright green leaves, which, however, do not attain such large dimensions as in *S. Dunnii*; flower-stems numerous, and 6–8-fld., forming a tolerably compact mass of fls.; corolla about 2 in. long and 1¼–1½ in. in diam., of a bright mauve-purple, striped with dark brownish purple in the throat." *N. E. Brown*. G. C. III. 2:247. I.H. 38:133.

Wátsoni (*S. lutea* × pollen of *S. Dunnii*). "The single leaf is similar to but rather smaller than that of *S. Kewensis*. It is exceedingly floriferous, having numerous flower-stems, bearing 10–16 fls. about 1¼ in. long and 1 in. in diam., of a bright rose-purple, with a white throat striped with brownish purple." *N. E. Brown*. G.C. III. 2:215. I.H. 38:134.—One of the finest of garden forms. Said to be sterile with its own pollen.

Dỳeri (*S. Wendlandii* × *S. Dunnii*). Leaf single, 2 ft. long and 15 in. wide, olive-green above and vinous purple beneath, soft-hairy: scapes 1–2 ft. or more tall, bearing many long-tubular red-purple flowers. G.F. 8:5.—One of W. Watson's hybrids.

Brùanti (*S. Rexii*×*S. polyantha*). Fls. larger than those of *S. Rexii*, 4–6 on each scape, mauve-blue, with whitish yellow throat.

S. biflòra, Duch., mentioned only in horticultural literature, and perhaps a garden form. It is of the S. polyantha type, with several blue fls.—***S. bifloro-polyánthus***, Duch., is a hybrid of S. biflora and S. polyantha, with several large light blue fls. F.S. 23:2429.—***S. caulèscens***, Vatke. One of the caulescent species, with opposite elliptic-oblong entire hairy lvs., the stem swollen, the fls. small (½ in. across) and pale lilac. Trop. eastern Afr. B.M. 6814.—***S. Gárdeni***, Hook. Allied to S. Rexii: scapes several, bearing 2 nodding pale lilac fls., with corolla 2¼ in. long. S. Afr. B.M. 4862. F.S. 12:1214.—***S. Greènii***, Hort., is a hybrid of S. Saundersii × pollen of S. Rexii: dwarfer and more compact than S. Saundersii, the scapes many-fld.: fls. pale lilac-blue. G.C. II. 17:303. Said to have been the first hybrid Streptocarpus. Raised by Mr. Green, Pendall Court, Surrey, England, in the garden of Sir George Macleay.—***S. Kirkii***, Hook. f., is one of the caulescent section, with opposite petiolate cordate-ovate subcrenate lvs., and many-fld. clusters of pale lilac fls., the corolla being about ¾ in. long. Trop. eastern Afr. B.M. 6782.—***S. Lichtensteinénsis***, Hort. Hybrid of S. Wendlandii×S. Watsoni. Lvs. 2, one prostrate and the other smaller and erect: fls. numerous, lilac-blue. —***S. multiflòra***, Hort. One of Laing's (England) types, a seedling of S. Rexii, with several large bluish purple fls. with darker lines in the throat. G.C. III. 18:211. I.H. 43, p. 67.

L. H. B.

STRÉPTOPUS (Greek, *twisted stalk;* referring to the peduncles). *Liliàceæ.* TWISTED STALK. A genus of 3 or 4 species of perennial herbs, from the temperate regions of Eu., Asia and N. Amer. with aspect of Polygonatum, from which it differs in having a 3-cleft style and perianth in separate segments. Woodland plants with slender branching stems: lvs. alternate, thin, clasping or sessile, prominently nerved: fls. rather small, rose or white, nodding, slender-pediceled; solitary or in pairs in the axils of the leaves: fr. a many-seeded berry. The closely related genus Disporum has terminal flowers, while those of Streptopus are axillary.

A. *Fls. purple or rose.*

ròseus, Michx. Rootstock short, stout: stem 1–2 ft. high: lvs. sessile, 2–4 in. long: peduncles less than 1 in. long, mostly 1-fld.: fls. about ⅓ in. long: berry red, ½ in. thick. May–July. Moist, rich woods in the northern states. B.B. 1:433.

AA. *Fls. greenish white.*

amplexifòlius, DC. Rootstock short, stout: stem usually taller than *S. roseus:* lvs. clasping, 3–6 in. long: peduncles 1–2 in. long, usually 2-fld.: fls. about ⅓ in. long: berry red. May–July. Moist rich woods, northern U. S. and Canada south to N. C. and New Mex. B.B. 1:432.

F. W. BARCLAY.

STREPTOSÒLEN (Greek, *streptos*, twisted, *solen*, tube, with reference to the form of the corolla-tube). *Solanàceæ*. Lvs. on long petioles, ovate, acute at both ends, entire, bullate-rugose: fls. rich orange-colored, pedicellate, in terminal corymbose panicles; calyx tubular-campanulate, shortly 5-cleft; corolla-tube elongated, widening above, spirally twisted below; petals 5, broad; perfect stamens 4. A monotypic genus from the United States of Colombia.

Jàmesonii, Miers (*Browállia Jàmesonii*, Hort., & Benth.?). Fig. 2436. Handsome evergreen scabrous-pubescent shrub, 4–6 ft. high, hardy and much cultivated in California as far north as San Francisco. June. G.C. II. 21:797. Gn. 26:447. R.H. 1883:36. B.M. 4605. F.S. 5:436. P.M. 16:6. G.M. 39:200. V. 7:298; 9:147.—An old favorite in northern greenhouses.

J. Burtt Davy.

2436. Streptosolen Jamesonii (× ⅛).

STROBILÁNTHES (Greek, *cone* and *flower*, referring to the inflorescence). *Acanthàceæ*. A large genus containing about 130 species inhabiting the warm regions of Asia and the Malay Islands to Madagascar. They are mostly erect, half-shrubby plants cultivated for their flowers and foliage. Only young, well-grown plants are attractive, the older ones becoming weedy and unattractive. Some species are grown as ornamental foliage bedding plants, but they are not as desirable for general use as the coleus, the slightest cool weather changing the color of their leaves to a very undesirable shade. In the greenhouse they make fine decorative foliage plants but require at all times a high temperature and an abundance of moisture and much syringing. Under unfavorable conditions they lose their leaves and become unsightly.

Lvs. opposite or rarely scattered, entire or toothed: fls. blue, violet, white or yellow, in terminal or axillary spikes or heads, or in loose cymes, mostly large; calyx deeply 5-parted, with linear lobes; corolla-tube narrow at base, straight or curved, enlarged above, limb of 5 spreading ovate or rotund equal lobes, or the dorsal pair united; stamens 4, perfect, or only the 2 lower perfect and the upper pair sterile and aborted, included; anthers with 2 parallel cells; capsule oblong or linear, slightly contracted at the base, 2-loculed; ovules 2 (rarely 3 or 4) in each locule.

Dyeriànus, Masters. An erect, branching, soft-wooded stove shrub: stem hirsute: lvs. opposite, 6–8 in. long, elliptic-lanceolate, serrulate, cordate at base, sessile, variegated with iridescent tints of blue and lilac, rose-purple beneath: fls. in erect spikes, 1⅛ in. long, pale violet; calyx unequally 5-lobed, lobes linear, obtuse; corolla-tube curved, ventricose, limb of 5 short, broad, revolute lobes. Burma. B.M. 7574. R.B. 20:133. J.H. III. 26:359. A.G. 17:297. V. 19:67.—Used for bedding.

callòsus, Nees. Shrub, 6–8 ft. high: lvs. elliptic-lanceolate, acuminate, puberulous, narrowed into a long, slender petiole which is winged to the middle: fls. in short, oblong spikes, large, pale violet-blue; corolla-tube very short, dilated into a subcampanulate throat and expanding into a limb 2 in. across; lobes orbicular, undulate. B.M. 7538.—A native of western India, where it forms a shrub 6–8 ft. high; said to flower in its third year.

isophýllus, T. Anders. (*Goldfússia isophýlla*, Nees). A low, much-branched, bushy shrub, 2–3 ft. high, swollen at the joints: lvs. short-petioled, opposite, narrowly lanceolate, distantly serrulate or entire: peduncles axillary, shorter than the lvs., bearing several fls.: corolla 1 in. long, funnel-shaped, blue and white; limb 5-lobed; lobes emarginate. India. B.M 4363. B. 5:244.—Used either for bedding or for pots. Blooms profusely either in winter or summer, according to treatment.

anisophýllus, T. Anders. (*Goldfússia anisophýlla*, Nees). Branches somewhat zigzag: lvs. broadly lanceolate, acuminate, serrulate, opposite but one of each pair much smaller than the other: fls. purplish and white; corolla funnel-shaped, very broad at the mouth, with a somewhat irregular 5-lobed limb. India. B.M. 3404. B.R. 11:955 (as *Ruellia persicifolia*). Similar to the preceding in habit and use.

Heinrich Hasselbring.

STROMÁNTHE (*couch* and *flower;* said to allude to form of inflorescence). *Scitaminàceæ*. Five tropical American plants (according to Petersen in Engler & Prantl's Naturpflanzenfamilien), closely allied to Calathea, Maranta, Phrynium and Thalia. It agrees with Maranta and Thalia in having a 1-loculed capsule, and thereby differs from Calathea and Phrynium, which have 3 locules. From Maranta it differs in having a very short perianth-tube and the segments not standing opposite each other. From Thalia it differs, as does Maranta, in having 2 side staminodia rather than one. For culture, see remarks under *Calathea*.

Porteàna, Griseb. (*Maránta Porteàna*, Horan.). Two to 4 ft. high, with maranta-like lvs., the blades long-elliptic or ovate-lanceolate, varying from acuminate to almost obtuse, purple beneath, bright green above with transverse stripes or bars of silvery white: fls. solitary or twin on the rachis, blood-red, the inflorescence simple or compound. Brazil. Lowe 26.

sanguínea, Sonder (*Maránta sanguínea*, Hort.). Leaf-blades about 1 ft. long, oblong-acuminate, purple beneath and green above: scape 12–20 in. tall, red towards the top, bearing a panicle of bright red and red-bracted fls. Probably Brazilian. B.M. 4646. F.S. 8:785.—An old garden plant. Thrives in an intermediate house and frequently attains a height of 5 ft. when planted in a border.

L. H. B.

STROPHOLÍRION (Greek for *twisted rope* and *lily*, referring to the twining stem). *Liliàceæ*. Very like Brodiæa, and sometimes referred to that genus, but differing in always having 3 stamens and a perianth which is contracted at the throat and saccate at the base. The only species is **S. Califórnicum**, Torr. (*Brodiæ̀a volùbilis*, Baker). In many ways it resembles *Brodiæa coccinea*, except that the scape is climbing to a height of 3 or 4 feet, and bearing an umbel of delicate rosy pink flowers. The scape twines readily about any stick or bush that stands near it. Lvs. 1 ft. or more long, keeled, ¼ in. or less broad: corm about 1 in. in diam. Central Calif., B.M. 6123. G.C. III. 20:687.—Culture as for *Brodiæa coccinea*.

Carl Purdy.

STRYPHNODÉNDRON is a genus of tropical American unarmed trees belonging to the legume family. Ten species are known, one of which is a native of Guiana, the others of Brazil. They are usually small trees with bipinnate foliage, numerous leaflets, and small fls. borne in axillary, cylindrical spikes. Fls. sessile, 5-merous; petals often connate to the middle, valvate; stamens none, free: pod linear, compressed, thick. Here belong *S. Guianense* and *S. floribundum*, both of which are known as Acacias, the latter as *A. pulcherrima*. Neither species is known to be cult. in America.

STUÁRTIA (in honor of John Stuart, Earl of Bute, a patron of botany; 1713–1792). Sometimes spelled *Stewartia. Ternstrœmiàceæ.* Ornamental deciduous shrubs or trees, with alternate, short-petioled serrate leaves and large showy white flowers solitary on short stalks in the axils of the leaves, followed by capsular fruits. *S. pentagyna* and *S. Pseudo-Camellia* are hardy as far north as Mass., while *S. Malachodendron* is tender north of Washington, D. C. They are very desirable ornamental plants, with handsome bright green foliage which turns deep vinous red or orange and scarlet in fall, and they are very attractive in midsummer with their white cup-shaped flowers, which are in size hardly surpassed by any others of our hardier shrubs. The Stuartias thrive in deep, rich, moderately moist and porous soil, preferring a mixture of peat and loam, and, at least in more northern regions, a warm, sunny position. Prop. by seeds and layers; also by cuttings of half-ripened or almost ripened wood under glass.

Five species occur in N. Amer. and E. Asia. Shrubs or trees, with smooth flaky bark: fls. axillary or subterminal, with 1 or 2 bracts below the calyx; sepals and petals 5 or sometimes 6, the latter obovate to almost orbicular, usually concave, with crenulate margin, connate at the base with each other and with the numerous stamens; styles 5, distinct or connate: fr. a woody, usually hirsute capsule, loculicidally dehiscent into 5 valves; seeds 1–4 in each locule, compressed, usually narrowly winged.

A. *Styles united: petals always 5.*

B. *Stamens purple, spreading: capsule subglobose.*

Malachodéndron, Linn. (*S. Virgínica,* Cav.). Shrub, 6–12 ft. high: lvs. oval to oval-oblong, acute at both ends, serrulate, light green, pubescent beneath, 2½–4 in. long: fls. 2½–3 in. across, with obovate spreading petals: seeds wingless, shining. May, June (July and August in the North). Va. and Ark. to Fla. and La. Gn. 14:136; 18, p. 628; 34, p. 280. G.C. II. 8:433.—This species has the largest and showiest flowers.

2437. Stuartia pentagyna (× ½).

2438. Stylophorum diphyllum (× ¼).

BB. *Stamens with whitish filaments, incurved: capsule ovate, pointed.*

C. *Bracts beneath the calyx large and leaf-like.*

monadélpha, Sieb. & Zucc. Shrub or small tree: lvs. oval to oval-oblong, acute at both ends, remotely serrulate, slightly pubescent beneath, light green, 1½–2½ in. long: fls. white, 1½ in. across, with flat, spreading obovate petals; anthers violet. Japan. S.Z. 1:96.—This is the least desirable species and probably as tender as the preceding; it is doubtful whether it is in cultivation. Specimens recently introduced seen by the writer proved to be the following species.

CC. *Bracts small, shorter than calyx.*

Pseùdo-Camèllia, Maxim. (*S. grandiflòra,* Briot. *S. Japónica,* var. *grandiflòra,* Hort.). Shrub, with upright branches, or tree attaining 50 ft. or more in Japan; trunk with smooth red bark, peeling off in great thin flakes: lvs. elliptic to elliptic-lanceolate, acute at both ends, or often acuminate at the apex, thickish, bright green, glabrous or nearly so beneath, 1½–3 in. long: fls. hemispherical, 2–2½ in. across; petals almost orbicular, concave, silky-pubescent outside; anthers orange-colored: seeds 2–4 in each cell, narrowly winged, dull. July, Aug. Japan. B.M. 7045. R.H. 1879:430. G.C. III. 4:187. Gn. 43:899. G.F. 9:35. M.D.G. 1900:480.

AA. *Styles 5, distinct: petals often 6.*

pentágyna, L'Herit. (*Malachodéndron ovàtum,* Cav.). Fig. 2437. Shrub, 6–15 ft. high: lvs. ovate to oblong-ovate, acuminate, usually rounded at base, remotely serrate, sparingly pubescent and grayish green beneath, 2½–5 in. long: fls. cup-shaped, 2–3 in. across; petals obovate, with wavy crenulate margin; stamens white, with orange-yellow anthers: capsule ovate, pointed, sharply 5-angled; seeds narrowly winged. July, Aug. N. C. and Ga. to Tenn. and Fla. B.M. 3918. B.R. 13:1104. M.D.G. 1900:479.

ALFRED REHDER.

STURTEVANT, EDWARD LEWIS, agricultural experimenter and writer, was born in Boston, Mass., January 23, 1842, and died at South Framingham, Mass., July

30, 1898. Though holding the degree of M.D. from the Harvard Medical School, Dr. Sturtevant never practiced the profession of medicine, but devoted his life to agricultural work, first specializing on Ayrshire cattle, then on pedigree corn (Waushakum) and muskmelons (New Christiana), and afterward devoting particular attention to the modifications which cultivated plants have undergone as shown by such records as occur in the older books. In connection with these studies, Dr. Sturtevant brought together a rare collection of books dealing with plants published before the time of Linnæus (say 1753), which, with his index cards and herbarium, is now preserved at the Missouri Botanical Garden in St. Louis, Mo.

As first director of the New York Experiment Station, at Geneva, Dr. Sturtevant drew the broad plans on which the successful work of that establishment has been conducted and which have served largely as models for subsequently organized agricultural stations over the country. He was a man of active mind, and his career is suggestive of worthy work to an unusual degree. A biographic sketch and a list of his principal writings are printed in the Tenth Report of the Missouri Botanical Garden. WM. TRELEASE.

STYLÓPHORUM (Greek, *style* and *bearing*, in reference to the persistent style). *Papaveràceæ.* A genus of probably 3 species of perennial herbs, one American and the others from southeastern Asia and Japan. Herbs with stout rootstocks and yellow sap: lvs. lobed or cut: fls. yellow or red, rather long-stemmed, solitary or clustered; sepals 2; petals 4; stamens numerous; placentæ 2–4; style distinct; stigma 2–4-lobed, radiate: capsule linear or ovoid, dehiscent to the base.

diphýllum, Nutt. (*Papàver Stylóphorum*, Hort.). CELANDINE POPPY. Fig. 2438. A hardy perennial about 1 ft. high, forming large clumps: stem with 2 lvs. at the summit: lvs. light green, pinnately parted: fls. yellow, 2 in. across, in clusters of 3–5. May, June. Moist shade, W. Pa. to Wis. and Tenn. B.B. 2:102. J.H. III. 34:475.—An attractive plant of easy culture in any rich, rather loose, moist soil in either shade or open, but preferably in partial shade. F. W. BARCLAY.

STÝRAX (ancient Greek name of *Styrax officinalis*). *Styracàceæ.* STORAX. Ornamental deciduous or evergreen trees or shrubs, with alternate, simple, serrate or entire leaves and white often pendulous flowers in axillary clusters or terminal racemes, followed by drupaceous dry or fleshy fruits. *S. Obassia*, *Americana* and *Japonica* are the hardiest and stand the winter in sheltered positions as far north as Massachusetts; *S. grandifolia* is hardy about Philadelphia and *S. Californica* only south. The Storaxes are handsome shrubs of graceful habit, usually loose and spreading. Their flowers are numerous, white and mostly fragrant. They are well adapted for borders of shrubberies or as single specimens on the lawn, and thrive best in a light, porous soil. Prop. by seeds sown soon after ripening and by layers; sometimes grafted on *Halesia tetraptera*.

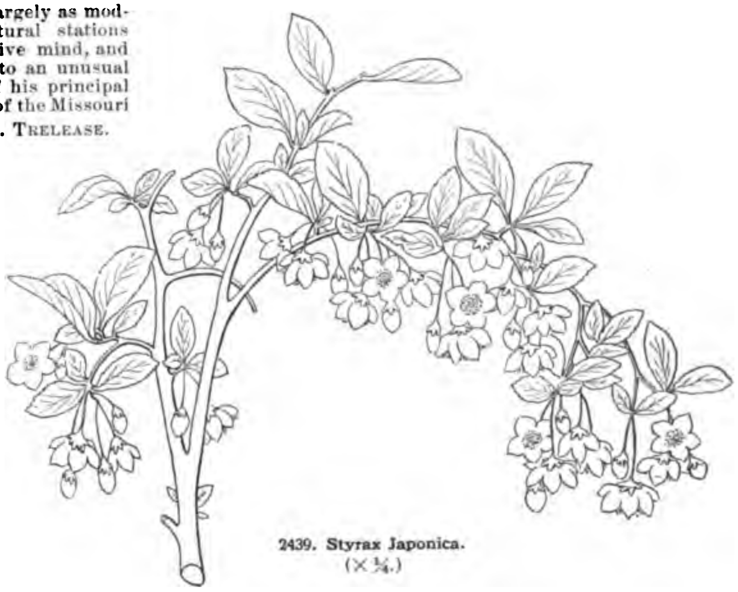
About 60 species in the tropical, subtropical and warmer temperate regions of America, Asia and Europe. Trees or shrubs: lvs. short-stalked, exstipulate, more or less covered, like the inflorescence, with stellate hairs: fls. white; calyx campanulate, obscurely 5-toothed or truncate; petals 5, connate only at the base; stamens 10, inserted at the base of the corolla and usually somewhat connate below: ovary superior, often united at the base with the calyx, 3-loculed at the base, 1-loculed at the apex; style slender: fr. a drupe, mostly subglobose, fleshy or oftener dry with dehiscent pericarp, 1–2-seeded, with large, subglobose seeds. *Styrax Benzoin* yields the benzoin, a balsamic exudation of the wounded tree; storax, a similar gum-resin, was formerly obtained from *S. officinalis*, but the storax of to-day is a product of Liquidambar.

A. *Fls. in many-fld. racemes: lvs. 2–10 in. long.*

B. *Young branchlets, petioles and racemes grayish tomentose.*

grandifòlia, Ait. Shrub, 4–12 ft. high: lvs. oval to obovate, shortly acuminate, usually narrowed toward the base, denticulate or almost entire, glabrous above, grayish tomentose or pubescent beneath, 2½–6 in. long: fls. fragrant, in loose racemes 3–6 in. long or sometimes in clusters; corolla fully ½ in. long, with spreading. oblong petals: fr. subglobose, about ⅓ in. across. May. S. Va. to Fla. L.B.C. 11:1016 (poor). B.B. 2:599.

BB. *Young branchlets, petioles and racemes soon glabrous.*



2439. Styrax Japonica. (× ¼.)

Obássia, Sieb. & Zucc. Shrub or small tree, 30 ft. high: young branchlets and petioles covered with a quickly disappearing floccose rusty tomentum: lvs. orbicular to broadly obovate or oval, abruptly acuminate, usually rounded at the base, remotely dentate above the middle and sometimes tricuspidate at the apex, glabrous above, pubescent beneath, 6–10 in. long: fls. fragrant, in racemes 5–7 in. long; rachis glabrous; pedicels and calyx finely tomentose; corolla ¾ in. long, with slightly spreading obovate-oblong petals: fr. ¾ in. long, ovoid, pointed. May. Japan. S.Z. 1:46. B.M. 7039. G.C. III. 4:131 (not correct in regard to habit). A.F. 12:30. M.D.G. 1898:16.

AA. *Fls. in few-fld. clusters or short racemes: lvs. 1–3 in. long.*

B. *Petals 5–8: branchlets and lvs. beneath pubescent.*

Califórnica, Torr. Shrub, 5–8 ft. high: lvs. broadly oval or ovate, obtuse, entire, stellate pubescent, at least when young, 1–2½ in. long: fls. in few-fld. tomentose clusters; pedicels about as long as calyx; corolla ¾ in. long, with 5–8 oblanceolate petals; stamens 10–16, with the filaments pubescent and connate about one-third. April. California.

BB. *Petals 5: lvs. almost glabrous, acute.*

C. *Pedicels about as long as calyx, puberulous.*

Americàna, Lam. (*S. glàbrum*, Cav. *S. lævigàtum*, Ait.). Shrub, 4–8 ft. high: lvs. oval to oblong, acute at both ends or acuminate, entire or serrulate, bright green and almost glabrous, 1–3 in. long: fls. nodding, in few-fld. clusters; pedicels about as long as calyx or little longer, puberulous; corolla about ½ in. long, almost glabrous, with spreading or reflexed, lanceolate-oblong petals; calyx-teeth minute, acute. April–June. Va. to Fla., west to Ark. and La. B.M. 921. L.B.C. 10:960. B.R. 11:952 (as *Halesia parviflora*).

co. *Pedicels ¾-1 in. long, glabrous.*

Japónica, Sieb. & Zucc. Fig. 2439. Shrub or small tree, becoming 30 ft. high, with slender spreading branches: young branchlets and lvs. with stellate pubescence, which soon disappears: lvs. broadly elliptic to elliptic-lanceolate, acute at both ends, often acuminate, crenately serrulate, glabrous, 1–3 in. long: fls. pendulous, in 3–6-fld. glabrous racemes; corolla about ⅛ in. long, with slightly spreading, elliptic, tomentulose petals; calyx usually with short and broad, obtuse teeth. June, July. Jap., China. S.Z. 1:23. Gt. 17:583. B.M. 5950 (as *S. serrulatum*). M.D.G. 1899:229, 230.

S. Bénzoin, Dryand. Small tree, allied to S. Japonica: lvs. stellate-tomentose beneath, also pedicels and calyx. Malay Archip.—*S. officinàlis*, Linn. Closely allied to S. Californica: petals 5–7; stamens connate only at the base. Mediterr. region. —*S. platanifòlia*. Engelm. Allied to S. Californica: almost glabrous: lvs. undulate or irregularly sinnately lobed. Texas. —*S. pulverulénta*, Michx. Low shrub, allied to S. Americana, but lvs. stellate-pubescent when young: fls. fragrant, on short, tomentose pedicels. S. Va. to Fla. and Tex. B.B. 2:599.—*S. serrulàta*, Roxb. Shrub or tree, 40 ft. high, allied to S. Americana: lvs. usually elliptic-oblong, acuminate, distinctly serrulate: fls. short-pediceled, in 5–10-fld. short racemes; calyx and pedicels tomentose. E. India. ALFRED REHDER.

SUCCORY. Another name for *Chicory*.

SUCCULENTS are desert plants that live on a minimum of moisture. Kitchen vegetables are said to be "succulent" when they are tender, sappy, full of juice, —as lettuce or cucumbers. In ornamental gardening "Succulents" are such tough and dry plants as cacti and century plants. The cacti are typical Succulents, as they represent a botanical family created by ages of desert life. Even in flower and fruit the cacti are much removed from other botanical families, and in the structure of their vegetable parts they are highly specialized to accord with desert conditions. Near to cacti, botanically, are supposed to be the ficoideæ, of which the large genus Mesembryanthemum is most important. The family Crassulaceæ contains many fleshy or succulent plants, the most important genera of which are mentioned under *Crassula*. Other families that have left survivors in the desert, though greatly altered in appearance and habits of life, are the lily family, e. g., Agave and Aloe; the spurge family, e. g., Euphorbia; the milkweed family, e. g., Stapelia; the purslane family, e. g., Portulaca, and among composites certain species of Senecio, Kleinia and Hertia. Rümpler's Die Sukkulenten, Berlin, 1892, is an illustrated book of 263 pages covering the above ground, mostly from the botanical side. Nearly all the good cultural books on cacti notice the succulent plants of other families. In this work consult *Cacti* and the various genera indicated above. See also special books published in Europe. There is no special American book literature. W. M.

SUGAR APPLE. *Anona squamosa.*

SUGAR BERRY. *Celtis occidentalis.*

SUGAR BUSH. In some English books this name refers to *Protea mellifera*, a plant not cult. in America. In the U. S., Sugar Bush, or Sugar Orchard, refers to a grove of sugar maples.

SUGAR CANE. See *Saccharum.*

SUKSDÓRFIA violàcea, Gray, and **Sullivántia Oregàna,** S. Watson, are two small perennial herbs of the saxifrage family native to the Columbia river region. They were once offered by western collectors but are not known to be in cultivation. They are fully described in Proc. Am. Acad. Arts. Sci., the former in 15:41, the latter 14:292.

SUMACH. See *Rhus.*

SUNDEW. *Drosera.*

SUNDROP. Yellow-flowered diurnal primroses (see *Primula*); also *Œnothera fruticosa.*

SUNFLOWER. Species of *Helianthus*. The common Sunflower of gardens is *Helianthus annuus*. This is grown for ornament, and the seeds (fruits) are also used as poultry food. Sunflower oil, produced in Russia, is used in salads. See Bull. 60, Div. of Chemistry, U. S. Dept. of Agric., by Harvey W. Wiley, on "The Sunflower Plant, its Cultivation, Composition and Uses," 1901.

SUN ROSE. *Helianthemum.*

SURINAM CHERRY. *Eugenia Michelii.*

SUTHERLÁNDIA (James Sutherland, one of the earliest superintendents of the Edinburgh Botanic Gardens, author of "Hortus Medicus Edinburgensis," 1683). *Leguminòsæ. Sutherlandia frutescens*, the BLADDER SENNA of the Cape, might be roughly described as a red-flowered Swainsona. It is a tender shrub said to grow 3 ft. high or more in South Africa. Each leaf is composed of about 9–11 pairs of leaflets and an odd one. The fls. are bright scarlet, drooping and in the best variety an inch or more long. The blossoms are not pea-shaped; the standard is oblong, with reflexed sides; the keel is longer than the standard, and the wings are very short. The fls. are numerous and borne in axillary racemes, 5–11 in a raceme. An interesting feature of the plant is its large bladder-like pod, which sometimes measures 2¼ x 1¼ inches.

Botanically Sutherlandia is very imperfectly understood. There are at most 5 species, or *S. frutescens* may prove to be the only one. Generic characters: fls. as described above; calyx campanulate, 5-toothed; stamens 9 and 1: ovary stalked, many-ovuled; style bearded: pod many-seeded, indehiscent: seeds reniform.

At the Cape *S. frutescens* runs into two forms. The common or typical one has the leaflets glabrous above, while in the seaside form, var. *tomentosa*, they are silvery white on both sides. In cultivation there seem to be three forms: (1) the typical species, which is generally treated as an annual in France. (If Sutherlandias are kept for several years in a greenhouse the plants become woody and unsightly and lose some of their foliage. Young, compact and bushy specimens are preferred.) (2) A form with larger red fls. (var. *grandiflora*), which in France at least does not flower until the second year. (3) A white-fld. form, which is probably one of two different things cultivated under the name of *S. floribunda*, but which is here called *S. frutescens*, var. *alba*.

Sutherlandias are highly esteemed by French connoisseurs. They are propagated by seeds and are said to be readily raised by cuttings. Seeds of the typical form are sown in March or April under glass and the plants bloom the same summer for several months. They seem to be usually kept in pots for the decoration of verandas, terraces, etc., but could probably be grown in the open border during summer. The seeds of var. *grandiflora* are generally sown in June or July, and the plants wintered in a greenhouse. They bloom toward the end of May, which is earlier than the typical forms. For winter treatment the French advise very moderate watering and as much air and light as possible. In America the Sutherlandias seem to be known only in California, though an eastern dealer has recently offered one under the name of "Scarlet Bush." The var. *grandiflora* is worthy of trial by northern florists. Flora Capensis 2:212. The species is hardy at San Francisco.

frutéscens, R. Br. BLADDER SENNA of the Cape. Tender South African red-fld. shrub described above. Harvey calls the typical form var. **commùnis**; it has lfts. glabrous above, elliptical or oblong: ovaries and pods glabrous. B.M. 181 (as *Colutea frutescens*). R.H. 1896, p. 206. Var. **tomentòsa,** Harv. Lfts. shorter and broader, obovate or obcordate, silvery white on both sides: ovaries and pods hispid. Var. **grandiflòra,** Hort. (*S. floribúnda*, Carr., not Vilm.), has large red fls. and does not bloom until the second year. R.H. 1871:610. Var. **álba** (*S. floribúnda*, Vilm., not Carr.) has white fls. Ernest Braunton, of Los Angeles, received in 1900 a plant called *S. spectabilis*, of which little is known. W. M.

SUWARRO. *Cereus giganteus.*

SWAINSÒNA (Isaac Swainson, an English horticulturist of the latter part of the eighteenth century). Often spelled *Swainsonia*. *Leguminòsæ*. About 25

Australian undershrubs and herbs, differing from Colutea chiefly in smaller stature and the large lateral stigma. Flowers pea-like, in axillary racemes, purple, blue, red, yellow or white, often showy; standard or vexillum large and showy, orbicular; wings oblong, twisted or falcate; stamens 9 and 1: fr. a turgid or inflated pod, which is sometimes divided by a partition and sometimes with the upper suture depressed; seeds small and kidney-shaped: lvs. unequally pinnate, usually with several or many small leaflets. Now and then various species are seen in the collections of amateurs or botanic gardens, and 8 species are offered by one German dealer, but by far the most popular kind is *S. galegifolia*, var. *albiflora*.

galegifòlia, R. Br. (*Vicia galegifòlia*, Andr. *Colùtea galegifòlia*, Sims. *S. Osbornii*, Moore). Small, glabrous, attractive shrub, with long, flexuose or half-climbing branches: lfts. 5–10 pairs and an odd terminal one, small, oblong and obtuse or somewhat emarginate: racemes axillary and mostly exceeding the foliage, bearing rather large deep red fls.: pod 1–2 in. long, much inflated, stipitate. Australia. B.M. 792.—*Swainsona galegifolia* is an old-time garden plant, blooming freely in a cool or intermediate house along with carnations and roses. It thrives well either as a pot-plant or in beds. It is hardy at San Francisco. It is a nearly continuous bloomer. Cuttings taken in late winter bloom in summer; these plants may then be transferred to the house for winter bloom, although maiden plants are to be preferred. By cutting back old plants, new bloom may be secured. Cuttings grow readily. The plant is easy to manage. The original form of Swainsona is little known in cultivation, but the advent of the white form has brought the species to the fore.

Var. **albiflòra**, Lindl. (var. *álba*, Hort. *S. albiflòra*, G. Don). Fig. 2440. Flowers pure white. B.R. 12:994. L.B.C. 17:1642. A.F. 8:1173; 10:611; 11:1180. Gng. 5:185.—In North America this is now one of the most popular of white florists' flowers for use in winter decorations. It has been called the "Winter Sweet Pea" because of the shape of the flowers, but it has no fragrance. The delicate bright green foliage affords an excellent contrast with the pure white flowers. This variety is often grown at the end of a rose or carnation house, or trained on a trellis. It likes abundant sunlight, rich soil and liquid manure. When allowed too much root room the plants become very large and are slow to bloom, wherefore a large pot or tub is preferable to the border.

Var. **violàcea**, Hort., has rose-violet fls., and is somewhat dwarf. *S. coronillæfolia*, Salisb., probably represents this form or something very like it. B.M. 1725. *S. coronillæfolia* is an older name than *S. galegifolia*, and if the two names are considered to represent the same species the former should be used.

Var. **ròsea**, Hort., has pink flowers.

S. Ferrandi, Hort., is called a "garden variety" by Kew authorities. Var. alba is described in R.H. 1886, p. 562, and var. carminea is in the American trade. L. H. B.

SWALLOW THORN. *Hippophaë rhamnoides.*

SWAN RIVER DAISY is *Brachycome iberidifolia.*

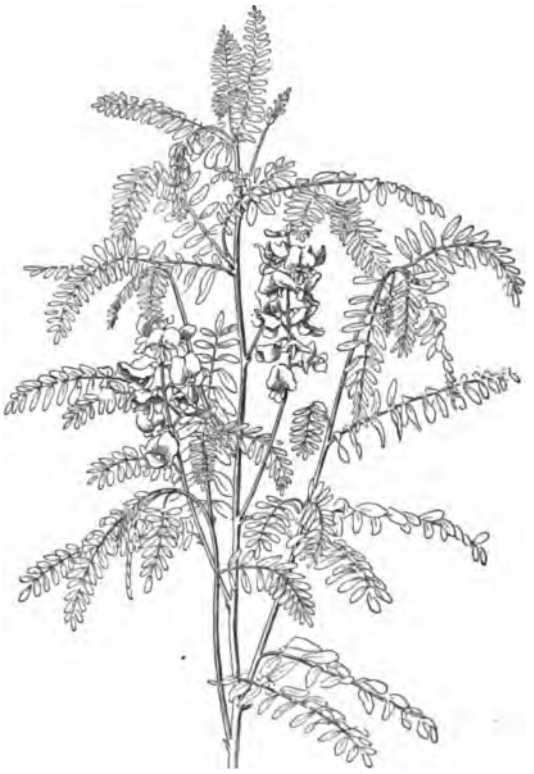
SWEET ALYSSUM. See *Alyssum maritimum.*

SWEET BASIL. See *Basil.*

SWEET BAY of general literature is *Laurus nobilis.* In America, *Magnolia glauca.*

SWEET BRIER. *Rosa rubiginosa.*

SWEET CICELY, or SWEET-SCENTED CHERVIL (*Mýrrhis odoràta*, Scop., which see), indigenous to Europe upon the banks of streams, is a graceful, hardy perennial 3 ft. tall, with very large, downy, grayish green, much-divided leaves, hairy stems and leaf-stalks, small, fragrant white flowers, and large brown seeds of transient vitality. The leaves, which have an aromatic, anise-like, sweetish flavor and odor, characteristic of the whole plant, are still occasionally employed in flavoring soups and salads, though their use as a culinary adjunct, even in Europe, is steadily declining. In American cookery, the plant is almost confined to our unassimilated, distinctly foreign population. Though easily propagated by division, best results are obtained from seed sown in the autumn either spontaneously or artificially; the seedlings, which appear in the following spring, are set 2 ft. apart each way in almost any ordinary garden soil. Spring-sown seed frequently fails to germinate. When once established common care will be sufficient. M. G. Kains.



2440. Swainsona galegifolia var. albiflora (× ¼).

SWEET CLOVER. *Melilotus alba.*

SWEET FERN. *Myrica Gale.*

SWEET FLAG. *Acorus Calamus.*

SWEET GALE. *Myrica Gale.*

SWEET GUM. *Liquidambar.*

SWEET HERBS. The term "Sweet Herbs" has long been applied to the fragrant and aromatic plants used in cookery to add zest to various culinary preparations, principal among which are dressings, soups, stews and salads. At the commencement of the nineteenth century many were to be found in gardens and kitchens that now have been dropped entirely or have but very limited use. Perhaps no group of garden plants during this time has been marked by so little improvement. Except in parsley, very few distinctly new or valuable varieties have been produced or disseminated. This is mainly due to the prevailing ignorance of their good qualities, to which ignorance may be charged the improper handling, not only by the grower, but by the seller and often by the final purchaser. With the public duly awakened to the uses of herbs, improvements in growing, handling, and in the plants themselves will naturally follow, to the pleasure and profit of all.

In this country the herbs best known and appreciated are parsley, sage, thyme, savory, marjoram, spearmint, dill, fennel, tarragon, balm and basil, arranged approximately in their order of importance. Since parsley is more extensively used as a garnish than any other garden plant, it is grown upon a larger scale than all other herbs combined. Hence some seedsmen do not rank parsley with Sweet Herbs. Sage is the universal flavoring for sausage and the seasoning *par excellence* for rich meats such as pork, goose and duck. It is more widely cultivated than thyme, savory and marjoram, which have more delicate flavors and are more popular for seasoning mild meats, such as turkey, chicken and veal. With the exception of spearmint, without which spring lamb is deemed insipid, and the famous mint julep, a thing of little worth, the remaining herbs mentioned above are scarcely seen outside our large city markets, and even there they have only a very limited sale, being restricted mainly to the foreign population and to such restaurants and hotels as have an epicurean patronage.

In many market-gardens both near to, and remote from, the large cities, sweet herbs form no small source of profit, since most of them, when properly packed, can be shipped in the green state even a considerable distance, and when the market is over-supplied they can be dried by the grower and sold during the winter. Probably more than one-half the quantities used throughout the country are disposed of in the latter manner.

As a rule, the herbs are grown as annuals and are propagated from seed sown in early spring, though cuttage, layerage and division of the perennials are in favor for home practice and to a certain extent also in the market-garden. Commercially they are most commonly grown as secondary crops to follow early cabbage, peas, beets, etc. In the home garden they are frequently confined to a corner easily accessible to the kitchen, where they remain from year to year. In general, herbs should be planted on good light garden soil of fine texture, kept clean by frequent cultivation, gathered on a dry day after the dew is off, dried in a current of warm, not hot air, rubbed fine and stored in air-tight vessels.

For specific information see articles on the following: *Anise, Angelica, Balm, Basil, Caraway, Catnip, Coriander, Dill, Fennel, Horehound, Hyssop, Marigold, Marjoram, Mint, Parsley, Peppermint, Sage, Samphire, Savory, Tarragon, Thyme.*

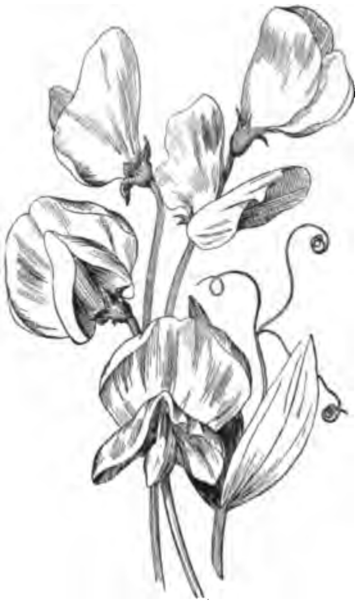
M. G. Kains.

SWEET LIME. See *Lime.*

SWEET MARJORAM. See *Origanum.*

SWEET PEA (*Lathyrus odoratus.* See *Lathyrus* for botanical account. For structure of the flower, see *Legume*). Figs. 2441–44. For its beauty and fragrance, the Sweet Pea is the queen of the large genus to which it belongs. Long a common garden annual, within recent years it has been brought to a high degree of development, until it ranks with the most popular garden favorites. It is also grown for high-class exhibitions and floricultural competition.

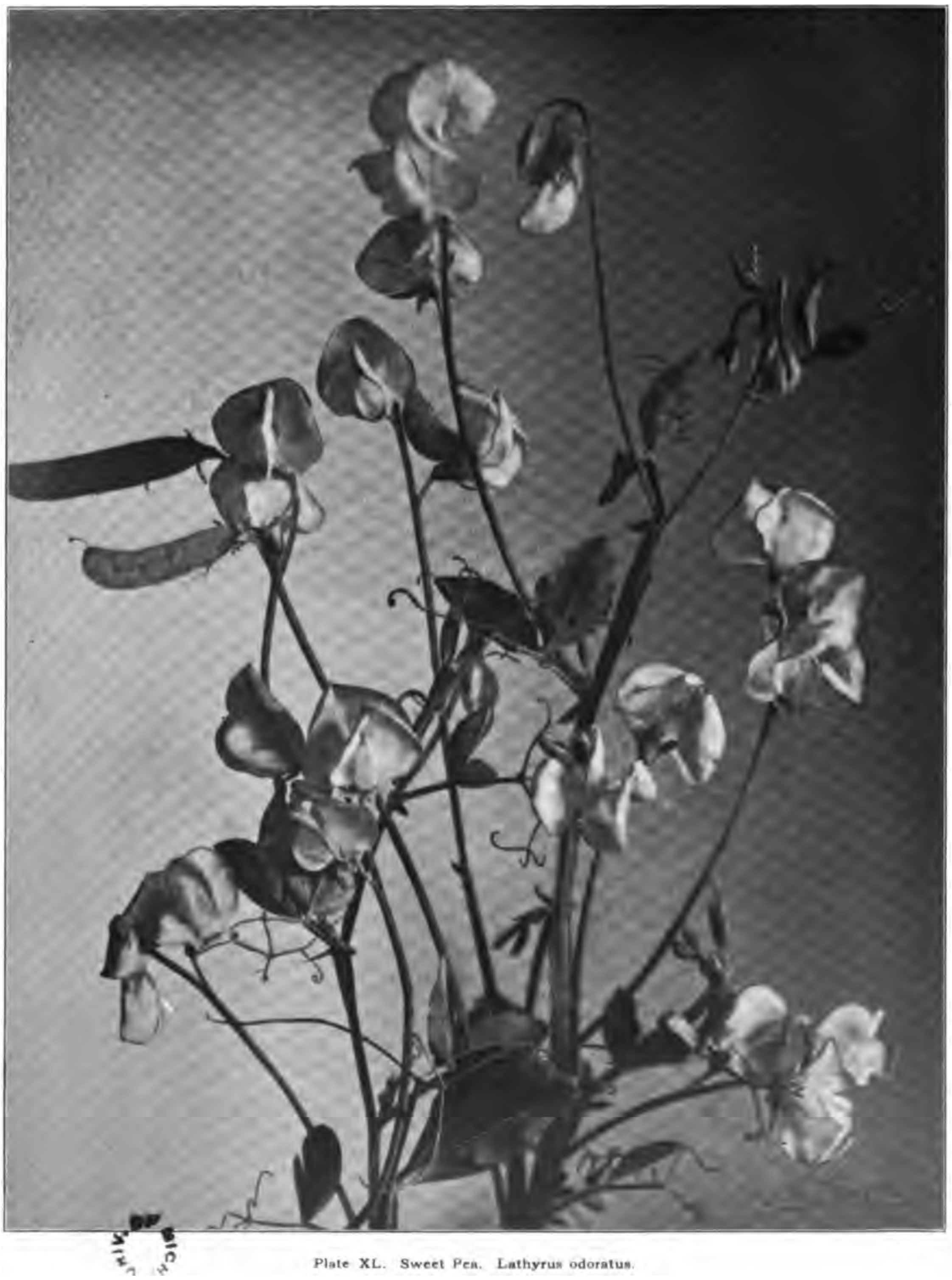
Its early botanical history has been traced back to 1650. The whole history of the Sweet Pea is elaborately treated by S. P. Dicks, of London, in American Gardening, for July 24, 1897. The origin of the Sweet Pea is divided principally between Sicily and Ceylon, the original purple variety being indigenous to the former island and Sardinia. Sicily was also the native habitat of the white variety, but all obtainable testimony credits Ceylon with the original pink and white variety known as the Painted Lady. Thence also came the original red out of which the crimson-scarlet sorts have come. Father Franciscus Cupani, a devout Italian monk and enthusiastic botanist, is credited with being the first cultivator of this flower, at Panormus, in Sicily, in 1699, and the seed of the purple variety was sent by him to England and elsewhere. The seed of this flower became an article of commerce as early as 1730 In 1793 a London seed catalogue listed 5 varieties, the black, purple, scarlet, white and Painted Lady. About 40 years later the striped and yellow are found named on the list. Not until 1860 do we find any further advance, when a blue-edged variety was offered, since known as Butterfly. In 1865 Invincible Scarlet won a certificate. In 1868 Crown Princess of Prussia appeared in Germany, and gave us the first light flesh-pink. Adonis in 1882 gave a new color in rose-pink, which was soon followed by a better shade in what was afterwards named Princess Beatrice. Several others of less value helped to prepare the way for the modern Sweet Pea as it has come from the skilled hands of Henry Eckford, the prince of specialists in this flower.



2441. Flowers of Sweet Pea, to show structure.

About 1876 Henry Eckford, of Shropshire, England, after long experience and signal success as a specialist in other florists' flowers, took up the Sweet Pea. He began with the 6 or 7 common sorts, working patiently by means of cross-fertilization and selection for seven years before he had anything of merit to offer. By that time he began to get new colors and a somewhat improved size and form. Orange Prince, the dark maroon Boreatton, and the deep bronze-blue of Indigo King, were among the cheering signs of his success in originating colors. But his novelties did not meet with popular appreciation till about 1890, when their merit of size and grandiflora form and originality of color began to excite a new interest in this flower, especially in America. Up to 1898 Eckford put out about 75 varieties, the product of 22 years of patient labor. A large percentage of his introductions has received certificates and awards of merit from the Royal Horticultural Society and at other English shows. Laxton, of England, and J. C. Schmidt, of Germany, are among those who have done special work in originating varieties.

At the time when this new interest in Sweet Peas awoke in America the increased demand for the seed led to the successful experiment of growing it in California. The demand soon increased till 125 tons of this seed were produced by the California seed-growers, and now practically the world's supply comes from that source. This also led to the production of American novelties in this flower, the extensive seed-growers having unequaled opportunity for finding new sorts and also of making them by cross-fertilization. The American novelties have the advantage of being introduced with stronger seed than the Eckfords. The complete list of varieties in 1898 numbered about 150 named sorts. The colors now represented are white, light primrose,



OF MICH

Plate XL. Sweet Pea. Lathyrus odoratus.

primrose-cream, buff-cream, buff-pink, various shades of light pink, flesh-pink, rose-pink, several shades of bright rose, scarlet, crimson-scarlet, rich blood-red, light blue, mauve-blue, dark blue, lavender, salmon-pink and also light rose, with more or less rich infusion of orange, purple, magenta, maroon with bronzy cast or rich velvety effect, and shades of violet. All of these are found in passably good selfs and also in contrasted and blended colors, and all these colors are now found in stripes and flakes. In 1893 the first dwarf Sweet Pea called Cupid was found in California, the white first appearing, and now practically all colors have been found in this diminutive form. In this form of sporting the plant totally abandons its vine habit, making a mat of dwarf foliage, the blossoms being of the usual size, but with very short stems.

The best canon of judgment gives no encouragement to the so-called "double" Sweet Pea, the grandiflora single form being the approved type, as it certainly is the most graceful and best adapted to the flower. The highest form of development which the Sweet Pea takes is first in bringing the single flower to the best grandiflora size and form, and then in adding to the number of flowers on the stem. The improved Sweet Pea now takes on 4 blossoms to a stem to some extent, and even 5 blossoms to a true single stem are not unknown. The length and diameter of the stem are also important in determining merit. Stems 14 in. long are occasionally exhibited, and the flower cannot be said to have high culture unless the stems are well on towards 10 inches in length. The finest grandiflora type of blossom has a standard which when pressed out will be nearly circular and will cover a silver dollar. The finest exhibition stock will now show some blossoms that measure 1¾ in. across.

Now that this flower is grown for the highest competitive test of skill, the rules for judging an exhibit are of importance. Although no scale of points has received general recognition, yet, allowing that each variety must be judged according to the correct individual type under which it was introduced, size of blossom, color, form, substance, number of blossoms on the stem and size of stem, are the essential points. The retrograde of stock is easily shown by the loss of full rounded outline, reflexed standard and deteriorated substance. Descriptive terms have been adopted by the growers to some extent, e. g., blossoms take the old common form, or are semi-expanded, boldly expanded, hooded, notched, shell-shaped, or grandiflora. Position of blossoms on the stem is also a point aimed at by the specialist.

2442. Gaiety Sweet Pea.

A good degree of success is now reported from ordinary gardens everywhere in the growing of this flower. Yet since it has been brought to its present highly hybridized and developed stage some of its hardy habits that formerly made it easy to grow have been reduced. Closer attention must now be paid to such rules of culture as have been found necessary. Tolerably rich soil inclining to a clay loam is best. Over-enriching will be likely to cause an excess of vine growth at the expense of bloom. In all light soil, firming the ground by treading or rolling it will be found a preventive of the early blight. The time for planting is as early as possible, the ground having been prepared in the fall, and the seed going in as soon as the frost is out. This first planting should be covered one inch, the place where the row comes being hollowed out about three inches to hold moisture. A later planting needs to be covered with three inches of soil. Slow germination and almost a standstill condition through the month of May is better than any forcing process. Only the thinnest top-soil should be disturbed in hoeing and no soil filled in earlier than June, if at all. Cutworms must be shown no quarter. A light mulch is excellent for shading the ground. Whatever support is given the vines must be strong and six feet high. A wire trellis answers well, but good birches give the vines a chance to ramble and they are cooler and more airy. Rows should run north and south. All the strength of the vines should be conserved by keeping the pods removed.

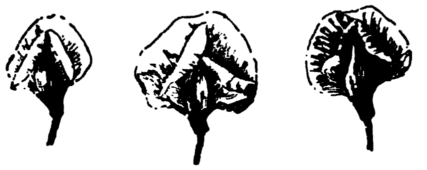
W. T. HUTCHINS.

2443. Red Riding Hood Sweet Pea.

CALIFORNIA'S CONTRIBUTIONS TO THE SWEET PEA.—The pink and white Sweet Pea, or, as it was popularly known, the "Painted Lady," is an old-time garden favorite which was greatly esteemed by flower lovers for its beautiful coloring and delightful fragrance. This type, with the old style white-flowered kind and a few small-flowered sorts of dull and unattractive coloring, constituted for many years the entire assortment of varieties known to gardeners. When any one spoke of the Sweet Pea the Painted Lady was understood, in the same way that in speaking of a tea rose the favorite Safrano was the variety always referred to. In the past twelve years all this has been changed by the wonderful improvements made by specialists in the development of this flower and its consequent popularity. Our list of varieties of the tall-growing or running type now numbers over 180 varieties.

This great improvement is due primarily to the work of Henry Eckford, of England, who has improved the Sweet Pea mainly by selection. The Laxtons also sent out a number of crosses, which were very distinct in coloring but of small size, and though the colors were rich they were not attractive. Owing to the climatic conditions under which he worked and his greater interest in the improvement of the flower, Mr. Eckford has not produced seed in sufficient quantities to greatly cheapen the price, and this element of popularity has been supplied by our own wonderland of flowers—California. In California, finely ripened seed can be produced in such large quantities that in two years after Mr. Eckford's introduction of a new variety our seedsmen are able to offer the seed at a price within the reach of every gardener. For a small outlay these novelties can be planted in masses unthought of by European gardeners.

California has done much more than this for the Sweet Pea, however. The Sweet Pea likes a cool soil and climate, the vines shriveling up during midsummer and succumbing to the red spider during the hot, dry weather which prevails over a very large portion of our country. To a certain extent, therefore, the popularity of this flower has been confined to the cooler northern states. In the effort of nature to adapt the plant to changed conditions, an entirely distinct type of growth soon appeared in the California fields, having a low, compact, spreading habit. The dense, deep green foliage lying closely to the soil, serves to mulch, shade and protect the strong network of roots lying beneath the surface. This type is known as the Cupid Sweet Pea. That it is apparently due to climatic influence is readily shown by the large number of distinct varieties we now have with this type of growth, many of which originated directly from the tall varieties, and not from sports of the original Cupid. This Cupid Sweet Pea succeeds excellently in hot, dry weather, and exposed dry locations where success with the tall varieties is exceptional. Conversely, the Cupid type does not succeed in cool, moist locations where the tall sorts do best, as the dense foliage does not dry out readily and is inclined to mildew.



2444. Three varieties of Sweet Pea, about half natural size, indicating the progress in size of flower.

The figure on the left shows a variety of the last generation; that on the right an average flower of today. The middle flower is the grandiflora type, reduced from a flower 1¼ in. across. Larger flowers can be secured, but it is a question whether they are desirable.

Two other distinct types have been originated in this country, the Bush Sweet Pea, which stands half-way between the Cupid and tall Sweet Peas in growth, needing no trellis or support but with the foliage held well above the soil and the flower-stems of greater length than in the compact Cupids. This type is also especially adapted to hot weather and dry soils, having a splendidly developed system of fine fibrous roots. The second type is the result of breeding and selection, as exemplified in Burpee Earliest of All, which has the true vine-like or running growth, but grows only 18 inches high and comes into full flower greatly in advance of the taller varieties of Sweet Peas without any sacrifice of size in the flower or of length in the stems. With this variety and early planting a great show of flowers may be had even in the southern states. Its early flowering habit makes it the most desirable of all varieties to grow under glass for winter flowering. Heretofore, the enthusiasm for Sweet Peas has been mainly in the cooler northern states, but with fall planting of the tall sorts and the adoption of the Cupid and Bush varieties for summer flowering in the hotter locations, there is no reason why they cannot be grown under more widely varying conditions than any other popular flower.

E. D. Darlington.

SWEET POTATO. *Ipomœa Batatas*, which see for botanical account. An edible tuberous root, much prized in North America, a staple article of food in all the southern states, and also much consumed in the North. The Sweet Potato plant is a trailing vine of the morning-glory family. The branches root at the joints. The edible tubers, Fig. 2445, are borne close together under the crown and unlike the common potato they do not bear definite "eyes." The varieties differ greatly in length of vine and the "vineless" Sweet Potato has a bushy habit. Good commercial varieties that are well cared for rarely bloom, and even then the flowers may not produce seed. The plant is tender to frost. The species is widely distributed in tropical regions but is supposed to be of American origin. It has been cultivated from prehistoric times by the aborigines. The plant is exceedingly variable in its leaves (Fig. 2446), and the varieties are sometimes classified on the foliar characters. In the southeastern states the word "potato" usually means sweet potato, the potato of the North being known as "Irish," "round" and "white" potato.

The Sweet Potato crop amounts to fifty million bushels annually. Large quantities are grown in the Carolinas, Georgia, Texas, Alabama, Mississippi, Virginia and New Jersey, the last state being the farthest point north where the crop is raised on a large scale. In California the yield is also large, particularly in the interior valleys and in places removed from the influence of the coast climates. The Sweet Potato is propagated by means of its tubers, usually from the slips or cuttings which arise when the tubers are planted in beds or frames. It is also propagated by means of cuttings or slips taken from the tips of fresh runners. A bushel of ordinary Sweet Potatoes will give from 3,000 to 5,000 plants, if the sprouts are taken off twice. An average good yield of Sweet Potatoes is 200–400 bushels per acre. Yields twice as high as these are sometimes secured.

In the northern states amateurs occasionally grow Sweet Potatoes of the southern types in a small way on ridges in the garden, but it is usually for the pleasure of the experience rather than for profit. A warm, sunny climate, long season, loose warm soil, liberal supply of moisture in the growing season and a less supply when the tubers are maturing—these are some of the requirements of a good Sweet Potato crop. The crop should be gathered immediately after the first frost. In the South a soft and sugary Sweet Potato is desired. In the North a firm, dry, mealy tuber is the prevalent type. Certain varieties of Sweet Potatoes are called "yams" in the South, but this name belongs historically to a very different kind of plant, for an account of which see *Dioscorea*.

There are two special American books on Sweet Potatoes, by Fitz and Price. For history, see Sturtevant in Amer. Nat., Aug., 1891, pp. 698, 699. Some of the most important bulletins are Farmers' Bull. 26, U. S. Dept. Agric. and Ga. 25 by Hugh N. Starnes. Md. 59 and 60 deal with the insects and diseases.

L. H. B.

Commercial Cultivation of the Sweet Potato. — The cultivation of the Sweet Potato as a staple crop is confined almost exclusively to the southern states. While it is true that the Sweet Potato occupies large areas in New Jersey and is also planted more or less extensively throughout portions of Illinois, Indiana and Ohio, by far the greater bulk of the crop is to be found below the 38th parallel of latitude. Hence the cultural details here given, as well as the memoranda on diseases, are compiled from a strictly southern standpoint.

Methods vary but little. Local environment enters less as a factor into Sweet Potato culture than into any other horticultural industry of the country. For this very reason it is remarkable that there should occur such extraordinary variations in type as are everywhere noted, and for which local environment, if anything, should be held responsible. So marked are these variations that without apparent cause any given "variety" so-called—more correctly, perhaps, "selection"—will develop, when transferred a few hundred miles from its place of origin, after a few years of cultivation in the hands of half a dozen different growers, just that many distinct types, each differing materially from the original in its more important characteristics—productiveness, maturity, quality and habit of growth. This difference extends, sometimes, even to a change in the form of the leaf itself from possibly an ovate shape with margin entire and with no more trace of a lobe than an apple leaf has, to a sagittate or halberd form or even to one deeply cleft or indented. See Fig. 2446.

Propagation is effected altogether by means of shoots, mostly those from th[illegible]s. While blooms are often found on the vin[illegible]rticularly in the extreme South—they are nearly always imperfect and invariably drop from the pedicel. No ovaries ever develop. Therefore the remarkable series of rapid transformations observable in the Sweet Potato must be credited entirely to an active and persistent tendency in the plant to bud variation—in effecting which it must be admitted to be a veritable kaleidoscope.

Propagation.—"Draws," or developed sprouts from root-buds, supply the readiest and, indeed, the only practicable means of propagation. Tubers of the last season's crop are "bedded" for this purpose; that is, an outdoor hotbed is constructed in which the tubers are placed in a single layer, close together, and covered with several inches of soil early in spring. In a few weeks the latent buds of the tubers, under the stimulus of the heat from the fermenting manure, will have sprouted, and by the time all danger from frost has passed a dense growth of "draws," or "slips" will cover the bed. These are removed from the tubers, set by hand in the field in rows four feet apart—the plants eighteen inches, generally, in the row. The size of the bedded tubers does not affect the crop. As good results are obtained from small as from large potatoes. Even the smallest tubers or "strings" consistently planted from year to year, produce as heavily as the choicest selections. This is but logical if we remember that the Sweet Potato is merely an enlarged, inaxial, fleshy root, and heavy tubers, when sprouted, should have little direct tendency to produce a crop of corresponding size, particularly when the subsequent cultivation is indifferent.

For later plantings the "bed" may be supplemented by cutting "slips" 12 or 14 inches long from the young vines after growth commences in the row, and using them as "draws." While the "slips" do not live quite so readily as the rooted "draws," they are said to make smoother and more sightly tubers—due, doubtless, to the fact that by this method the mycelium of the black rot is not conveyed from the bed to the field.

Soil and Fertilization.—Although a gross consumer of nitrogen, the Sweet Potato cannot advantageously occupy "bottomland." With this reservation it may be said that almost any land will produce potatoes. Yet a light, sandy loam is best. Stiff, red soil is to be avoided, as in it the potato splits, cracks and "roughens," by reason of the suspension and sudden resumption of growth during variable weather.

The most approved fertilizer formula has been found to be, per acre, about as follows:

	Lbs.
Nitrogen (ammonia equiv. 50 lbs.)	40
Phosphoric acid	90
Potash	50

This requirement would be met by a compound of:

	Lbs.
High-grade acid phosphate	640
Nitrate of soda	260
Sulfate of potash	100
Total	1,000

Cottonseed meal has been found in many localities preferable to sodium nitrate, as it is not so readily soluble and therefore more gradual and continuous in action through the season. It may be substituted in the formula for sodium nitrate in the ratio of two pounds for one. Potassium muriate produces as heavy a crop as potassium sulfate, but the latter considerably increases the starch content, which in southern-grown potatoes is unusually large. For potash, kainit may be substituted in the proportion of four pounds of kainit to one of either potassium sulfate or muriate. Stable manure of normal composition produces excellent Sweet Potatoes, but is, of course, too variable in character and too uncertain in quantity to be generally available.

A complete summary of methods employed in Sweet Potato culture would occupy too much space. They are, moreover, too familiar to require repetition. Yet it is desirable to call especial attention to certain points which have been insufficiently discussed in previous publications. First among these is the practice of premature planting. Against this tendency earnest protest should be entered. It is the cause of much loss. When an early market crop is not the object there is no need for haste in putting out the draws, since the season is abundantly long for leisurely planting, even in June, after oats and wheat are harvested. If planted in May, or earlier, with the long southern season, the crop is likely to mature before the approach of cold weather permits the proper housing. The consequent and usual result is a "second growth," which predisposes the tubers to the inroads of the "soft rot," which causes great loss.

2445. Sweet Potatoes.

A deep, mellow soil-bed, with an extended season, unquestionably will produce more and larger, but later, tubers. Shallow preparation will yield an earlier crop. It follows that the deeper the soil the earlier the planting may be effected.

Preservation.—Were it possible to successfully and inexpensively preserve through the winter the Sweet Potato crop, southern agriculture would be practically revolutionized. Land capable of producing a bale of cotton, worth, say $40, will readily yield 300 bushels of potatoes, at half the cost for cultivation, worth, at 20 cts. per bus., $60. This the planter would gladly take, at harvest time, but there is then no market at any price. Yet six months later he cannot supply the demand at 60 cts., or $180 per acre. These figures are conservative. Even on poor soil, producing 500 pounds seed cotton (one-third of a bale) per acre, the yield in Sweet Potatoes—100 bushels, a very small output—could be sold in the spring for $60 were it possible to successfully keep the tubers through the winter. Many succeed in so doing, and reap the reward, but it is still an unsolved general problem. Methods, too, are variable in the extreme—and this is the one notable exception to the rule of uniformity prevailing in Sweet Potato culture. Climate and local environment seem here to play an important part, and means of preservation found successful in one place prove entirely unserviceable in another—personality, even, entering as a factor in the problem, one man failing where another, by the same methods, succeeds. Many ways have been devised and practiced, some simple, some elaborate; but each said by its enthusiastic originator or advocate to be absolutely infallible.

Nothing has yet been found that will effectually supersede the well-known popular method of "banking" or "hilling" in quantities of from 30 to 50 bushels, according to the different local customs which prevail in each community. The ordinary practice is to heap the tubers in a conical pile around a perforated wooden flue, covering them with a few inches of dry pine-straw, then a layer of corn stalks, and finishing with three inches of dry sand and afterward two or three inches of clay or other stiff soil. The hill may be constructed either under shelter or out-of-doors. If the latter it is well to protect with a covering of boards to keep off the rain, though not absolutely necessary.

Diseases and Maladies.—A few of the most important maladies of the Sweet Potato—the cause, indeed, of nine-tenths of the loss experienced in attempts to winter the crop—will be noted in the probable order of their importance:

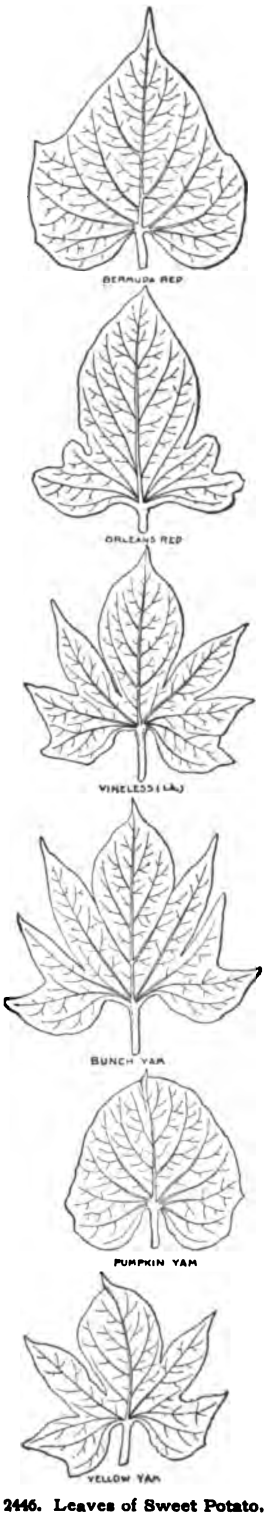
(*a*) *Soft Rot* (*Rhizopus nigricans*): This is the most common form of rot, and the one that produces the most damage. It is due to a fungus or mold on abraded places, chiefly of the tuber, especially when the potatoes are stored in large bulk, without sufficient opportunity to dry out. It is perhaps the main cause of loss with stored potatoes, developing rapidly and immediately, under favoring conditions, and reducing, sometimes in a few weeks, the entire contents of a bin or hill to a pulpy mass of corruption, emitting a most disgusting odor. A few simple remedial measures will greatly reduce loss from this cause: (1) Dig only when soil is dry. (2) Dig before tubers become sappy from a "second growth." (3) Remove all affected tubers before storing. (4) Use padded baskets in handling to avoid abrasion. (5) Store in small bulk and keep dry and well ventilated.

(*b*) *Black Rot* (*Ceratocystis fimbriata*): The fungus producing this affection does not depend so much on the conditions of moisture and abrasion, and is slower in making its appearance than is the soft rot, continuing to develop, however, all through the winter and often completing the destruction the other has begun. It is all the more to be dreaded because it is not so immediately noticeable, and tubers containing its germs are more likely to be housed. The black rot does not produce a pulpy mass, though effectually destroying the entire tuber. It frequently makes its appearance on the young draws at "setting-out time." Remedy: careful selection — 1st, of sound tubers for bedding; 2d, of perfectly healthy draws for setting; 3d, where these conditions cannot be fully complied with, by planting the bulk of the crop with cuttings from the vines, thus minimizing the damage. The use of copper sulfate, or any of the standard fungicides, either as a spray or for soaking the tubers, is not advisable; for, since the mycelium of most of the fungi causing decay in the Sweet Potato is lodged in and protected by the interior cells of the tuber, surface treatment would prove more or less futile.

(*c*) *Soil Rot* (*Acrocystis Batatas*): This fungus, as its name implies, is a resident of the soil rather than of the tuber, and hence cannot be readily guarded against. It is responsible for most of the decay observed in the crevices or cracks of split tubers. Sudden expansion of vegetable tissue due to a resumption of rapid growth when wet weather follows a period of drought, particularly when the soil is a stiff clay, produces the primary "cracking" and the spores of the fungus, finding a ready lodgment, start the process of decay. As for remedies, heavy applications of sulfur to the soil have been found to check its ravages in a measure, but this method of operation is not practical. That is to say, while checking the fungus the result is not commensurate with the cost. The surest preventive—and this is true for any and all rots—is rotation. The same areas should never be planted in potatoes two years in succession, nor should the same spot be used twice for a hotbed to furnish draws, even at the cost of great inconvenience in establishing the bed in another place.

(*d*) *Other Fungi:* Several other fungi are serious enemies of the Sweet Potato, as the stem rot, white rot, dry rot, potato scurf, leaf blight, etc.; but their ravages will not compare with the damage produced by the first three—soft rot, black rot and soil rot.

As for the first three, it matters little to the practical grower whether or not he is able to distinguish one from another. After the conditions favoring the spread of one of them have been permitted to develop and the resulting decay once appears, it is usually too late to put remedial measures into effect. Remedy, in this case, must precede manifestation of disease. Every possible precaution should be observed at one and the same time against them all. Proper preventive effort during harvesting will be found a surer guarantee against loss from decay than the most elaborate structure or the most carefully detailed method of housing yet devised, and when thoroughly enforced little apprehension need be felt as to results, no matter what plan of preservation is adopted.



2446. Leaves of Sweet Potato.

Adapted from Bulletin of the Georgia Experiment Station.

To this end the following summary of procedure will be found serviceable:

a. Rotate the crop. Never plant twice in succession on the same land.

b. Rotate the bed. Never use old soil or old manure a second season.

c. Dig only when the soil is dry.

d. Dig before tubers are rendered moist and sappy by a "second growth," and to this end never plant too early in spring.

e. Use padded baskets in handling to prevent bruising and abrasion.

f. Handle with scrupulous care.

g. Reject all affected tubers before storing.

h. Store dry, in small bulk; if in bins erect bulkheads and use flues for ventilation.

i. Use only perfect tubers for bedding, rejecting any showing symptoms of decay.

j. Use only healthy and unaffected draws for setting out.

k. When draws in bed are affected with diseased roots (*black rot*) and cannot be thrown away, plant in a separate plat and take cuttings from their vines later for the main crop.

Varieties. — Since new varieties of the Sweet Potato can originate only by bud variation, it is a marvel where and how all of the different types arise. The writer has personally cultivated and tested some fifty odd kinds, and there doubtless exist, in all, 75 or 80—the number still increasing. But one uniform method of classification exists — that by the "leaf" into tribes, falling under the three heads, "Leaves entire," "Leaves shouldered or lobed" and "Leaves cleft" — commonly termed "round-leafed," "shouldered" and "split-leafed," respectively. Of these the second type is the most numerous, containing probably two-thirds of the entire list.

As for the best variety, the "all-round" potato has not yet been found, nor is it likely to be, since such a type should be a tremendous yielder, of first quality, a safe keeper and free from disease. No potato embodies, superlatively, all of these characteristics. All of the heaviest yielders belong, unfortunately, to the "milky" or "turpentine" group—as Norton, Hayman, Southern Queen, White St. Domingo, Early Golden, etc.,—and their sappy consistency prevents them from keeping well, while their quality is uniformly poor. Regarding quality, however, tastes differ. The northern market prefers a dry, mealy potato, represented by the Jersey or Nansemond strain. The southern market, on the other hand, demands a rich, sugary potato, like the Georgia or Yellow Yam, which is generally considered to be the standard of excellence, and is a good keeper though yielding very lightly.

The market it is intended to supply should, therefore, be specially planted for. If for northern shipment, the Jersey Sweet is preferable. For early local sale Orleans Red ("Nigger-killer"), Early Golden or Bermuda Red, head the list. For winter storage and local market in spring it is best to rely on the good old popular standard—the Georgia Yam—despite its light yield, or reinforce it with Vineless, which closely approaches it in quality and is a much heavier cropper.

Hugh N. Starnes.

SWEET SCABIOUS. See *Scabiosa.*

SWEET-SCENTED SHRUB. See *Calycanthus.*

SWEET-SOP. *Anona squamosa.*

SWEET SULTAN. See *Centaurea moschata.*

SWEET VERNAL GRASS. See *Anthoxanthum.*

SWEET WILLIAM is *Dianthus barbatus.*

SWÈRTIA (after Emanuel Swert, a bulb cultivator of Holland and author of *Florilegium*, 1612). *Gentianàceæ.* About 40 species, widely scattered about the world but mainly from S. Asia, of annual or perennial herbs with simple leaves, mainly radical in the perennial species and yellow, blue or white flowers in loose or rather dense corymbs.

Calyx 4–5-parted: corolla rotate, with a very short tube and glandular pits at the base of each lobe; lobes 4–5, overlapping to the right: ovary 1-loculed: capsule dehiscing by 2 valves at the sutures.

dilùta, Benth. & Hook. (*Ophèlia dilùta*, Ledeb.). A tender perennial about 1 ft. high: stem winged and angled, branching from near the base: lvs. glabrous, ovate-lanceolate, 3-nerved, rather obtuse, rounded at the base, short-petioled: fls. 4-merous, blue, in a dense, fastigiate umbel; corolla-lobes ovate, rounded at the apex and bearing at the base a single ovate, nectariferous pit destitute of a fringe. E. Asia, Japan.

perénnis, Linn. A hardy perennial ½–1 ft. high: lower lvs. oblong-elliptical, long-petioled; stem-lvs. ovate-oblong, obtuse: fls. mostly 5-merous, blue to white, in a thyrse; corolla-lobes elliptical-oblong, acute, bearing at the base 2 orbicular nectariferous pits crested with a fringe. Colo., Utah and northward; also in the alpine regions of Europe and in Asia.—*S. perennis* is an alpine bog plant and should be given a cool, deep, moist soil.

F. W. Barclay.

SWIETÈNIA (Gerard van Swieten, 1700–1772, physician to Empress Marie Theresa in Vienna). *Meliàceæ.* This genus contains the mahogany tree, a tree of high importance in the furniture trade. The young trees are offered by nurserymen in S. Fla. and S. Calif. A tropical genus of 2 or 3 species of tall trees, with abruptly pinnate leaves with opposite petioled obliquely ovate long-acuminate leaflets and small flowers in axillary or somewhat terminal panicles: calyx small, 5-parted; petals 5, spreading; staminal tube urn-shaped, 10-toothed; disk annular: ovary ovoid, sessile, 5-loculed: capsule about 3 in. through.

Mahágoni, Jacq. Mahogany. A large tree with hard dark red wood of well-known value for furniture, etc. Lfts. 6–10: fls. greenish yellow. Tropical regions' of North and South America, West Indies and S. Florida.—According to Mueller's "Select Extra-tropical Plants," the degree of endurance of the tree is not sufficiently ascertained. In Jamaica it hardly reaches an elevation of 2,000 ft. It requires rich soil. According to Reasoner Bros., the tree will bloom at small size when grown in pots.

F. W. Barclay.

SWISS CHARD. See *Beta, Greens, Salad Plants.*

SWORD LILY. *Gladiolus.*

SYCAMORE in Europe is *Acer Pseudo-platanus;* in America *Platanus occidentalis.* The Sycamore of the ancients was a kind of fig known as Pharaoh's Fig, *Sycomorus antiquorum*, or better *Ficus Sycomorus.*

SYMBIOSIS is the intimate association of two or more distinct organisms, with benefit to one only, or to both; commensalism; consortism; copartnership. In this association each organism is called a symbiont.

According to the character of the union, several kinds of symbiosis have been recognized: (1) Mutual antagonistic symbiosis (mutual parasitism), when two organisms are foes of each other, as certain bacteria and animals, the latter showing a "natural resistance;" also the syntropism of certain lichens with lichens. (2) Antagonistic symbiosis (true parasitism), when the host is partly or completely killed by the parasite, as the potato and the rot fungus (*Phytophthora infestans*): or galls (*hypertrophies*) produced on the host as in the black knot of plums; and in higher plants, which live at the expense of others, as the mistletoe (green) and the dodder (chlorophylless). (3) Mutual symbiosis, when there is often reciprocal advantage; (*a*) nutricism, when one symbiont nourishes the other without apparently receiving any return, as the mycorrhiza and the roots of forest trees; (*b*) mutualism, when a mutual benefit results from the union of two organisms capable of living separately, as the bacteroid and the roots of the Leguminosæ; (*c*) individualism, when the symbionts are so intimately connected in their growth as to suggest a single individual, as the union of alga and fungus to form a lichen. (4) Prototrophy, the wet nurse relationship, as in the lichen *Lecidea intumescens*, which eventually gets its nourishment by means of a lodger, a different lichen. (5) Contingent symbiosis, when one symbiont lives in the interior of another for shelter, as Nostoc in the tissues of Hepaticæ, Lemna, Cycas, Gunnera; and Anaboena in Azolla.

John W. Harshberger.

2447. Symphoricarpos racemosus (× ½).

SYMPHORICÁRPOS (Greek, *fruit borne in clusters*). *Caprifoliàceæ.* Shrubs with simple, opposite, oval, entire and exstipulate lvs.: fls. small; calyx 4–5-toothed; corolla campanulate or bell-shaped, 4–5-lobed on short pedicels; stamens 5, exserted; stigma capitate: fr. a 4-loculed, but 2-seeded berry. About 10 species.

These little American shrubs are all excellent plants for covering the ground under trees, for massing in the lower parts of beds or borders, or for detached groups where something low is desired. They will thrive in almost any soil from heavy clay to dry gravelly banks. Their habit of suckering enables them to cover the ground rapidly and effectively. All have a tendency to retain their fruit until it is forced off, and one species retains its foliage. For these reasons they are pleasing additions to the winter landscape. Of easy propagation by suckers, seed or cuttings.

A. *Fruit white.*

B. *Stamens and style included.*

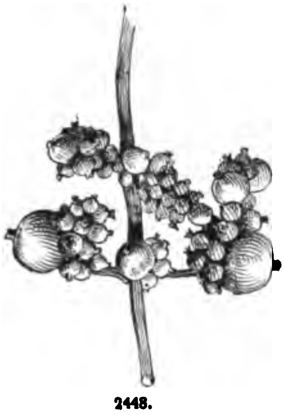
racemòsus, Michx. Snowberry. Waxberry. Fig. 2447. A shrub, 2–6 ft. high: lvs. smooth, entire or sometimes repand or even lobed: fls. rose color, in a loose and often leafy raceme; stamens and style included: fr. globose, white, persistent. July, Aug.

Eastern N. A. B.B. 3:235.—A smooth shrub with slender branches usually bending under its load of berries.

Var. **pauciflòrus**, Robbins, is of smaller growth and has fewer fruits. Mn. 2, p. 10. B.B. 3:236.

BB. *Stamens and style exserted.*

occidentàlis, R. Br. WOLFBERRY. This may be considered as the western form of our eastern species, but it is less attractive than the preceding, as it is less fruitful and the individual berries are not as clear and waxy. Lvs. ovate: fls. in spikes, both terminal and axillary; stamens and style exserted: fr. the same dimensions as white. July. Mich., north and west. G.F. 3:297. B.B. 3:236. A shrub of about the last and closely resembling it, the exserted stamens and style being the most obvious distinction.



2448.

Fruits of Indian Currant—Symphoricarpos vulgaris (× ½).

Showing how few of the fruits develop.

AA. *Fruit red.*

vulgàris, Michx. INDIAN CURRANT. CORAL BERRY. Fig. 2448. Lvs. ovate: fls. in dense axillary and terminal spikes; style and stamens included: fr. dark red. July. Along rivers and rocky places N. J. to Dakotas, south to Ga. and Tex. Mn. 1, p. 84. Gn. 34, p. 280.—A rather more compact bush than the two previously described species. Valuable because of its abundant persistent fruit and foliage. Var. **variegàtus**, Hort., has the leaves marked white and yellow and is the same as var. *fòliis variegatis.* Var. **glomeràtus**, Hort., is a form with longer terminal spikes.

JOHN F. COWELL.

SYMPHYÁNDRA (Greek; *anthers grown together*). *Campanulàceæ. Symphyandra Hofmanni* is a hardy perennial herb, 1–2 ft. high, with pendulous bell-shaped flowers 1⅛ in. long and an inch or more across. The fls. are borne in a large leafy panicle. Under favorable conditions in England this plant has maintained a succession of bloom from July to December. T. D. Hatfield finds that in this country "the plant is liable to exhaust itself in blooming, thus behaving like a biennial. It has large, fleshy roots, needs a dry position and sows itself."

Symphyandra is a genus of about 7 species of perennial herbs found in the region of Asia Minor. Its special botanical interest lies in the fact that the anthers are grown together into a tube, which character tends to annul the distinction between the Campanula and Lobelia families. Otherwise the genus is much like Campanula.

Generic characters: caudex thick: lvs. broad, usually cordate, dentate; radical lvs. long-stalked; stem-lvs. few or small: fls. white or yellowish, usually nodding, racemose or loosely panicled: inflorescence centrifugal: calyx-tube adnate, hemispherical or top-shaped, with or without reflexed appendages between the lobes; corolla bell-shaped, 5-lobed: ovary 3-loculed.

Hófmanni, Pant. Much branched, pilose: branches decumbent: lvs. oblanceolate, acute, doubly dentate: calyx with large, leafy, cordate segments, hemispherical tube and no appendages; corolla hairy inside. Bosnia. B.M. 7298. Gn. 57, p. 303. G.C. III. 4:761.—This desirable bellflower has been cult. by amateurs in the East. It sometimes spreads rapidly in half-shaded rockeries and sows itself.

W. M.

SÝMPHYTUM (Greek, *to grow together*, in reference to the supposed healing virtues). *Borraginàceæ.* COMFREY. About 16 species of perennial herbs from Europe, Asia and N. Africa, with usually tuberous roots: lvs. simple, often decurrent, and with rather small yellow, blue or purplish flowers pediceled in terminal, simple or branched cymes: calyx 5-cut or parted, lobes linear; corolla tubular, lobes very short and nearly erect; stamens 5, attached to the middle of the corolla-tube, included: nutlets 4; seeds nearly globular.

Of easy culture in any good soil. The shade of overhanging trees is not objectionable. When grown for the beauty of the variegated foliage the flowering stems may be removed with advantage.

A. *Lvs. decurrent on the stem.*

officinàle, Linn. A hardy branching perennial, about 3 ft. high: root thick: lower lvs. large, broadly lanceolate: upper lvs. narrower: fls. small, pale yellow or purplish, in drooping cymes. June, July. Eu., Asia.

Var. **variegàtum**, Hort., has leaves widely margined with creamy white. A beautiful variegated plant especially attractive in spring, when the coloring of the leaves is brightest and the large rosettes have not yet sent up any flower-stems. F.S. 18:1901–1902.

AA. *Lvs. not decurrent on the stem.*

aspérrimum, Donn. PRICKLY COMFREY. Fig. 2449. A hardy perennial, more vigorous than *S. officinale*, often 5 ft. high: lvs. ovate-lanceolate, prickly on both sides: fls. reddish in the bud, becoming blue, smaller than in *S. officinale.* June, July. Caucasus. B.M. 929.—Var. **variegàtum**, Hort., has leaves distinctly margined with yellow.

J. B. KELLER and F. W. BARCLAY.

SYMPLOCÁRPUS. See *Spathyema.*

SÝMPLOCOS (Greek, *symplocos*, entwined or connected, the stamens being connate at the base). Including *Hopea* and *Lodhra. Styracàceæ.* Ornamental deciduous or evergreen trees or shrubs, with alternate, entire or serrate lvs. and usually white fls. in racemes or panicles, rarely solitary, followed by berry-like, black, red or blue fruits. Only the deciduous *S. cratægoides* is hardy north; it is a shrub with abundant white fls. in spring and bright blue fruits in autumn. It thrives in well-drained soil and sunny position. The half-evergreen *S. tinctoria*, which seems not hardy north of its natural habitat, prefers moist soil and shady situation. The evergreen species are all tender and little known in cultivation. Prop. by seeds, which usually do not germinate until the second year, and by greenwood cuttings under glass; also by layers.

About 160 species widely distributed through the tropical regions except Africa; only a few outside the tropics. Mostly trees: fls. in terminal or axillary racemes or panicles, rarely solitary; calyx 5-lobed; corolla 5-parted, often almost to the base; stamens numerous, usually connate at the base; style filiform: ovary 2–5-loculed, inferior: fr. a drupe, with 1–5 1-seeded stones. Several species have medical properties; *S. tinctoria* yields a yellow dye.

2449.

Symphytum asperrimum. (× ⅛.)

cratægoides, Buch.-Ham. (*S. paniculàta*, Wall. *Lódhra cratægoides*, Decne.). Deciduous shrub or sometimes tree, attaining 40 ft., with slender, spreading branches, forming an irregular open head; young branches pubescent: lvs. short-petioled, oval or obovate to oblong-obovate, acute or acuminate, sharply serrate, distinctly veined beneath and more or less pubescent at the veins, rarely glabrous, 1⅓–3 in. long: fls. white, fragrant, ⅓–½ in. across, with spreading oblong-oval petals in panicles 1½–3 in. long: fr. usually 1-seeded. oval, blue, about ⅓ in. high. May, June. Himalayas to China and Japan. G.F. 5:89. M.D.G. 1901:100, 101.

S. coccínea, Humb. & Bonpl. Evergreen tree: lvs. oblong, acuminate, crenulate, 3–5 in. long: fls. solitary, axillary, pink. 1 in. across, with 10 petals. Spring. Mexico. R.H. 1846:281, F.S. 2:133.—*S. Japónica*, DC. (S. lucida, Sieb. & Zucc.). Evergreen shrub or small tree, 20 ft. high: lvs. elliptic to oblong, acute, remotely serrate, glabrous, 2–3 in. long: fls. yellowish, in short, few-fld. racemes: fr. oblong, red. Spring. Japan. S.Z. 1:24. A shrub which has been distributed from several botanic gardens under the name of S. Japonica has proved to be Pyracantha crenulata.—*S. Sínica*, Ker. Deciduous shrub, closely allied to S. cratægoides: lvs. elliptic, acute, serrate, pubescent on both sides, 1⅓–2 in. long: fls. white, in short panicles; calyx-teeth acute. May, June. China. B.R. 9:710.—*S. Sumúntia*, Buch.-Ham. Small evergreen tree: lvs. oblong-elliptic, acuminate, cuneate at the base, serrulate, glabrous, 3–5 in. long: fls. white, in short racemes: fr. oblong. Himal. Gt. 31:1073.—*S. tinctòria*, L'Hérit. SWEET LEAF. HORSE SUGAR. Half-evergreen shrub or small tree, attaining 18 ft.: lvs. oblong, acute, obscurely serrate, pubescent beneath, 3–5 in. long: fls. yellowish, fragrant, in axillary, dense clusters: fr. oblong, ⅓ in. long, orange-brown. Spring. Del. to Fla. and La. S.S. 6:255, 256.

ALFRED REHDER.

SYNADÈNIUM (Greek name, indicating the united glands). *Euphorbiàceæ*. A genus of 3 species of somewhat succulent shrubs of Madagascar and tropical Africa, differing from Euphorbia in having the glands of the involucre united into a ring.

Grántii, Hook. Smooth, thick-branched, 6–10 ft.: lvs. ovate-spatulate, 3–4 in. long: dichotomous cymes with red involucres. Tropical Africa. B.M. 5633.—Sometimes cultivated with succulents in botanic gardens.

S. arboréscens, Boiss., has yellow involucres. B.M. 7184.

J. B. S. NORTON.

SYNCÁRPIA (Greek, *together* and *fruit*, referring to the head-like clusters of capsules). *Myrtàceæ*. Two species of Australian trees with opposite, ovate, penninerved, evergreen leaves and rather small white flowers in dense, globular heads either solitary in the axils or in terminal panicles: calyx-tube adnate to base of ovary, the free part erect or dilated with usually 4 persistent lobes; petals generally 4, spreading; stamens many, free: ovary inferior, 2–3-loculed; ovules 1–several to each cell; seeds linear-cuneate.

laurifòlia, Tenore. TURPENTINE TREE. Lvs. broadly ovate to elliptic-oblong, obtuse or obtusely acuminate, 2–3 in. long, often appearing as if in whorls of 4: fls. 6–10 in a head, with 2–4 bracts of variable size under the head; calices connate at the base; petals broadly ovate or orbicular, less than 2 lines long: ovary 3-loculed; ovules several to each locule.—According to Von Mueller's "Select Extra-tropical Plants," this tree attains a height of 200 ft., with a trunk often 30 ft. in circumference; it is of quick growth and well adapted for a shade tree. The wood is very durable and almost fireproof and is valuable for piles, railway sleepers and shipbuilding. It takes a high polish and is used for flooring and cabinet work. Offered in S. Calif.

F. W. BARCLAY.

SYNDÉSMON (Greek, *bound together*, because the plant unites characters of Thalictrum and Anemone). *Ranunculàceæ*. RUE ANEMONE. A monotypic genus of eastern North America. Glabrous perennial herb from a cluster of tuberous roots: basal lvs. 2–3-ternately compound: involucre similar but sessile, the lfts. being stalked: fls. white or pink, in an umbel; pedicels slender; sepals thin; petals none; stigma sessile, truncate: akenes terete, deeply grooved. The more common generic name is Anemonella, which dates from 1839, but Syndesmon was used in 1832. The plants should be grown in partial shade and in light moist soil, where they should be left undisturbed for years. They will then form a carpet of great beauty. Prop. by division of roots in spring or fall.

thalictroides, Hoffmg. (*Anemòne thalictroides*, *Thalictrum anemonoides*, Michx.). Plant 3–6 in. high: lvs. much like those of Thalictrum: fls. resembling those of *Anemone quinquefolia*, appearing before the basal leaves. March–June. Common in woods and open fields. L.B.C. 10:964. Gn. 35:699. B.M. 866. I.H. 6:211.—Var. **flore-plèno**, Hort. Flowers double. Very pretty. L.B.C. 8:770. F.S. 11:1155. R.B. 11:205.

K. C. DAVIS.

SYNGÒNIUM (Greek name, said to refer to the cohesion of the ovaries). *Aràceæ*. About 10 species of tropical American woody climbing or creeping plants, with milky juice and stems rooting and leaf-bearing at the nodes: lvs. sagittate, becoming with age pedately 5–9-parted, on long petioles, with a persistent accrescent sheath: peduncles short: spathe yellowish or whitish green; tube small, ovoid, persistent: spadix shorter than the spathe: staminate fls. with 3–4 stamens, pistillate fl. with oblong-ovoid 2 or abortively 1-loculed ovary; seeds solitary in the locules, obovoid or globose, black. All the aroids are monographed in Latin in DC. Mon. Phan. vol. 2, 1879.

podophýllum, Schott. A tender creeping plant: lvs. becoming 5–7-pinnatisect, 4–6 in. long; petioles becoming 15–20 in. long: tube of the spathe 1–1⅓ in. long: blade of the spathe 2⅓ in. long, greenish outside, white within. The typical form is probably not in cult.

Var. **albolineàtum**, Engl. (*S. albolineàtum*, Bull.), has whitish costæ and lateral nerves. Offered by John Saul, 1893, presumably as a tender foliage plant.

F. W. BARCLAY.

SÝNTHYRIS (Greek, *together* and *little door* or *valve*, the valves of the capsule long adhering below to the short placentiferous axis). *Scrophulariàceæ*. Six species of hardy herbaceous perennials, native to western North America. *S. reniformis* is a tufted plant bearing a few scapes about a foot high. The inflorescence is a raceme about 5 in. long with about 40 purple-blue fls. each ⅜ of an inch across. In England this plant is considered a winter bloomer; it flowers there in February or March, occasionally November.

Synthyris is nearly related to Wulfenia of southeastern Europe and the Himalayas, but the anther-cells are not confluent and the seeds are discoidal. In their native region they are summer-blooming plants with small purplish or flesh-colored spikes or racemes. Generic characters: Plants glabrous or pilose: rhizome thick: radical lvs. petioled, ovate or oblong and crenate or incised-pinnatisect: calyx 4-parted; corolla-tube very short; lobes 4 or none; stamens 2; style entire at apex: capsule compressed.

renifórmis, Benth. Larger and stouter plant than the next, with more acutely cut, leathery lvs., longer and stouter scape and raceme, shorter pedicels, narrow sepals and corolla-lobes, a globose corolla-tube and more seeds in the cells. Ore. to Wash. Introduced by Woolson, Passaic, N. J.

rotundifòlia, Gray. Smaller, with weak, slender scape 3–4 in. high, shorter than the membranous, broadly crenate lvs., a small few-fld. raceme, broader sepals and corolla-lobes, fewer seeds in the cells and capsule divaricately 2-lobed instead of merely emarginate. Shady coniferous woods of Oregon. Offered in 1881 by Edward Gillett.

W. M.

SYRÍNGA (of doubtful meaning; probably from *syrinx*, pipe, because pipes are easily made from the straight stems of Philadelphus by removing the pith, and the name Syringa had been originally applied to Philadelphus, but was transferred afterwards to the Lilac). *Oleàceæ*. LILAC. Ornamental deciduous shrubs or rarely trees, with opposite, slender-petioled, entire lvs. and lilac, purple or white fls. in large and showy upright panicles. The Lilacs are among our most popular and ornamental flowering shrubs, and hardly any garden or park is found without them. The fragrance of the common Lilac is very sweet, as also of *Syringa oblata* and *S. pubescens*. The strong odor of *S. Chinensis* is not agreeable to every one. *S. villosa* and *Josikæa* are almost scentless. *S. Amurensis* and its allies have only a slight odor similar to that of the Privet. Almost all species are hardy north. *S. villosa*, var. *Emodi*, is somewhat tender north.

The Lilacs are very showy in bloom, especially when massed in groups, and these as a rule are the more effective the fewer different varieties they contain. The mixing of species and varieties differing in habit and blooming season only spoils the effect, and so does too great a variety of colors. Some species, as the tree-like *S. Japonica*, *S. Pekinensis* and *S. villosa*, are very handsome as single specimens on the lawn. *S. Japonica* is the only tree of the genus; it attains a height of 30 ft. *S. vulgaris*, *Amurensis* and *Pekinensis* sometimes grow into small trees or at least large shrubs 10–20 ft. high. *S. Persica* is the smallest species and seldom exceeds a few feet. The first in bloom is *S. oblata*, followed closely by *S. vulgaris*, *Chinensis*, *pubescens*, *Persica*, *villosa* and *Josikæa*; after the middle of June *S. Amurensis* and *Pekinensis* come into bloom, followed at the last by *S. Japonica*, which blooms in the North in the beginning of July. *S. Amurensis* and *Pekinensis* sometimes bloom sparingly a second time in fall. The foliage is bright green and handsome, but drops comparatively early in fall, especially in the case of *S. Japonica*, without assuming any fall coloring as a rule. In *S. oblata* the foliage turns to a deep vinous red and remains until November. In *S. Pekinensis* it is retained until late in fall and finally assumes a purplish hue or turns pale yellow.

2450. Syringa villosa. (× 1-5.)

The foliage is not much attacked by insects, but a fungus, *Microsphæra alni*, late in summer often covers the whole foliage of *S. vulgaris* and also of *S. Chinensis* and *Persica* with a white mealy coat, while *S. oblata* is but rarely troubled with this fungus and the other species never. Much damage is sometimes done by a borer, *Trochilium denudatum*, which lives in the stems and branches of *S. vulgaris*, but is rarely found in any other species.

After blooming, the inflorescence should be removed if possible and the pruning be done as far as necessary. Pruning in winter or spring would destroy a large part of the flower-buds for the coming season. Lilacs grow in almost any kind of soil, but a rich and moderately moist one is the most suitable. They are easily transplanted at any time from fall to spring. *S. vulgaris* and its numerous varieties are the most popular of the Lilacs on account of their early and profuse blooming, their sweet fragrance and the variety of colors ranging from dark purple to lilac, pink and white. The double-flowered varieties keep the blooms longer, but the panicles are less graceful and they usually do not bloom as profusely as the single ones; they also remain mostly dwarfer and have a more compact habit. The faded fls. do not fall off, but remain on the inflorescence; this gives the plant a very unsightly appearance if the faded panicles are not removed. W. J. Stewart suggests a word of warning against Lilacs not on their own roots, because of the attacks of borers and the bad habit of suckering in some cases.

Some of the best single-flowered vars. are the following:

SINGLE-FLOWERED LILACS.

White: *Alba grandiflora*; *Alba pyramidalis*; Frau Bertha Dammann, A.F. 12:1078; Madame Moser; Marie Legraye, one of the very best, B.H. 29:135; Princess Marie.

Blue, lilac or pink: Ambroise Verschaffelt, pale pink; Dr. Lindley, pinkish lilac, F.S. 14:1481; Géant des batailles, bluish lilac; Geheimrath Heyder, light lilac; Gigantea, bluish red; Gloire des Moulins, pale pink; Goliath, purplish lilac; Lovaniana, light pink; Macrostachya, light pink (Princess Alexandria is a favorite variety of this class in America); Sibirica, purplish lilac; Trianoniana, bluish lilac.

Red: Aline Mocqueris, dark red; Charles X (Caroli), dark lilac-red, A.F. 12:1076. F. 1873, p. 76; Marlyensis, sometimes called Rubra de Marley, lilac-red; *Rubra insignis*, purplish red.

Dark purple: Philemon; Ludwig Späth (Andenken an Ludwig Späth, Louis Späth), very large panicles, the best of the dark vars

DOUBLE-FLOWERED LILACS.

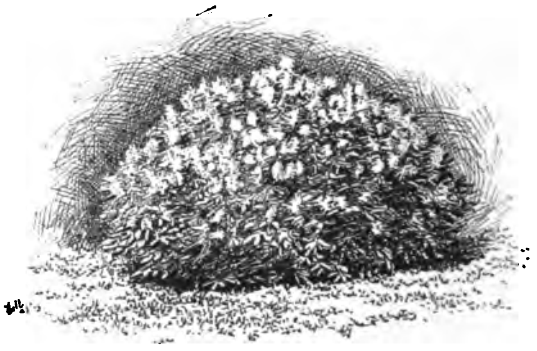
White: Madame Abel Châtenay, compact panicles; Madame Casimir-Perier, large, graceful panicles, one of the best; Madame Lemoine, large fls. in dense panicles; Obélisque; Virginité, white and pink.

Blue, lilac or pink: Alphonse Lavallé, bluish lilac, A.F. 12:1077; Belle de Nancy, fls. pink with white center; Charles Baltet, lilac-pink; Condorcet, blue, A.F. 12:1074; Doyen Keteleer, lilac-blue; Jean Bart, pinkish violet; Lamarck, pale lilac, large, rather loose panicles; Lemoinei, lilac-pink, B.H. 28:174; Léon Simon, changing from pinkish to bluish lilac. Gt. 43:1407; Maxime Cornu, pinkish lilac; Michel Buchner, pale lilac, large and very double fls.; President Carnot, pale blue.

Purple: Charles Joly, dark purplish red, one of the darkest; Comte Horace de Choiseul, lilac-purple; La Tour d'Auvergne, violet-purple.

The Lilacs have been favorite forcing plants in France for more than a century and are nowadays among the most important cut-flowers during the winter season in France as well as in Germany and England. They are on the market from the end of September until they bloom outdoors. Charles X is considered one of the very best for forcing. Marlyensis, Marie Legraye, *Alba virginalis*, Ludwig Späth and other varieties are also good for forcing. Of the double-fld. varieties the following have proved adapted for forcing: Madame Casimir-Perier, Madame Lemoine, Charles Baltet, Jean Bart, Léon Simon, Chinensis duplex and others. Either grafted plants or plants on their own roots are used. Both force equally well, but grafted Lilacs can be grown into plants well set with flower-buds and suited for forcing in two or three years, while plants grown from cuttings require four to six years. Marlyensis is always used on its own roots and prop. either by seeds, cuttings or division. Special attention must be given to pruning in order to have well-branched plants of good, compact habit (see Fig. 851, Vol. II, p. 600). The Lilac has nothing like the commercial importance for forcing in America that it has in Europe, but the appreciation of it for winter bloom is on the increase in this country.

Lilacs are generally forced in pots, being potted usually in July or in the forepart of August, that they may fill the pots with new roots before winter. Some growers pot the plants in spring or in the preceding fall. This practice is of especial advantage if the plants are intended for very early forcing. These early potted plants are then plunged into the ground outdoors, mulched, well watered and regularly manured; after June, when the young growth is almost finished, only enough water is given to prevent wilting. When the flower-buds have been formed, more water is given until they have reached their full size. It is essential to keep the plants



2451. Syringa villosa.

2452. Syringa vulgaris, the common Lilac (× ⅓).

rather dry in fall, so that the wood may ripen thoroughly and early. When the leaves have fallen off, the plants are stored away in convenient places, where they are sheltered from severe frost. Sometimes the Lilac, especially Marlyensis, is forced from balls of earth which are not potted, but this does not always give satisfactory results.

About three to four weeks is required to force the plants into bloom with the temperature recommended below. The first days after bringing the plants into the forcing room, a temperature of 55–60° may be given, gradually raising to 78–88° and maintained as equally as possible until the panicles are fully developed and the first flowers begin to expand; then the temperature is lowered to 60–66°, and when the panicles are about half open the plants are transferred to a cool greenhouse. Hardening-off is essential to ensure good keeping qualities of the flowers. The red-flowered varieties are often forced in darkened rooms in order to have the flowers blanched or only slightly colored. The shade of color depends entirely on the time when full light is given and also on the temperature. Show plants in pots should be grown in full light to have the foliage well developed. While the temperature is higher than 76°, frequent syringing is necessary. It is, of course, possible to force Lilacs in a lower temperature, and this will be even advisable if the longer time required does not count. Full advice for commercial Lilac forcing is given by Fr. Harms in "Flieder und Asparagus," a book devoted almost exclusively to Lilac forcing.

Interesting experiments recently conducted have shown that the Lilac is more readily forced when the plants are subjected to the influence of ether during forty-eight hours shortly before forcing. An account of these experiments by W. Johannsen is entitled "Das Ætherverfahren beim Frühtreiben mit besonderer Berückrichtigung des Flieders." That the ether has a particular effect on the metamorphosis and regeneration of the albuminoids in the plant has been stated recently by other botanists also.

Lilacs may be prop. by seed, which is sown in spring. This method is usually practiced only with the more common typical species. The many varieties and rarer kinds are usually prop. by greenwood cuttings under glass in June (or in early spring from forced plants), by hardwood cuttings, by grafting and also by suckers and division, especially in the case of *S. Chinensis, Persica* and *vulgaris*.

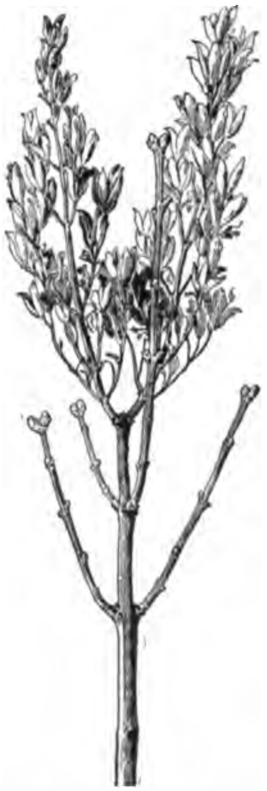
As a stock *S. vulgaris* is mostly used and sometimes Ligustrum. *S. Japonica* will probably prove to be a good stock. *S. villosa*, though readily growing from seed and of vigorous habit, is not to be recommended. Budding in July and August is the most extensively practiced method. Grafting is done either in April or May in the open or in February or March in the greenhouse on potted stock. Almost any kind of grafting may be employed, as the Lilac unites readily. Crown-grafting is to be preferred in order to avoid the troublesome suckers. Plants intended for forcing but deficient in flower-buds are sometimes grafted in October or early in November with branches well set with flower-buds and forced in January or later.

About 11 species from southeastern Europe to Himalayas and Japan. Lvs. exstipulate, deciduous, evergreen only in *S. sempervirens:* fls. in panicles; calyx small, campanulate, 4-toothed; corolla salverform, with cylindrical tube and 4-lobed limb; stamens 2: ovary 2-loculed: fr. a leathery, oblong or oval capsule, loculicidally dehiscent, with 2 winged seeds in each locule. Fig. 2449. In *S. sempervirens* (not yet introduced), the capsule is fleshy, one-seeded and drupe-like.

Alfred Rehder.

Forcing Lilacs. — Most of the Lilacs used by American commercial florists for forcing are imported. Care should always be taken to procure pot-grown plants, that is, plants that have been grown in pots the previous summer. The florist who wishes to grow his own plants should lift them in the field in April or before the growth starts and pot them without losing much root. Plunge them out-of-doors during summer and give them plenty of water. This treatment will insure a good growth and the

2453. Capsule of Syringa vulgaris (× 3).



2454. Winter twig of Syringa vulgaris (× ½). Showing the absence of a terminal bud, and the persistent dehisced pods.

check the plants receive from lifting will induce them to form new flower buds. These plants will force with the greatest certainty. It is well to allow five weeks for the earliest forcing. A strong heat is necessary, beginning at 60° for the first few days and increasing to 75° or 80°, with a daily watering and syringing several times. After the flowers begin to open the syringing can be discontinued and when fully expedient the plants are better removed to a cool house, where they will harden off and be much more serviceable when cut. As the season advances, say March and April, less heat is needed. They will then force in any ordinary house where the night temperature is about 60° F. The Persian Lilac on account of its abundance of bloom and delicate truss is very desirable, but this must be forced almost in the dark to produce white flowers. *Marie Le Graye* is for all purposes the most useful Lilac which the undersigned has used for forcing.

Wm. Scott.

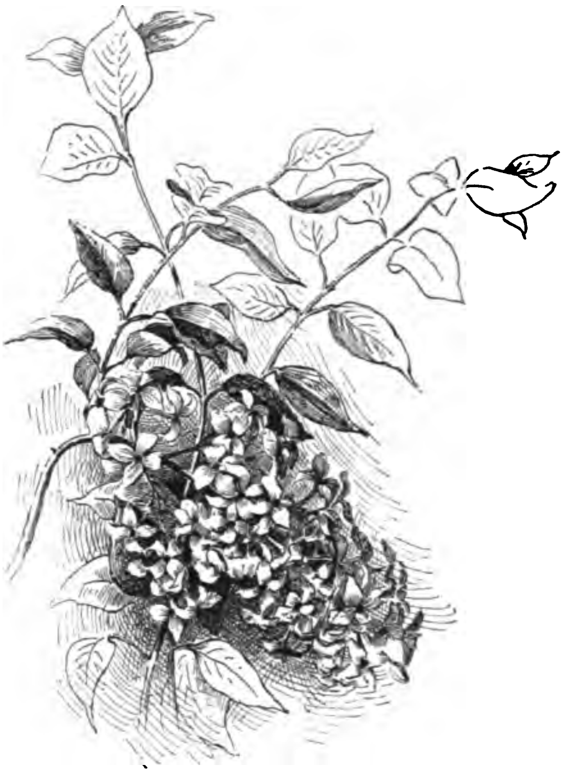
INDEX.

alba, 4, 6, 7, 8.
Amurensis, 10.
argentea, 11.
aurea, 2.
aureo-variegata, 2.
Bretschneideri, 2.
Chinensis, 7.
cærulea, 6.
dubia, 7.
duplex, 7.
Emodi, 2.
filicifolia, 8.
hyacinthiflora, 5.
Japonica, 11.
Josikæa, 1.
laciniata, 8.
ligustrina, 10.
Mandshurica, 10.
Marlyensis, 6.
Metensis, 7.
oblata, 4.
ovalifolia, 3.
pallida, 1.
Pekinensis, 9.
pendula, 9.
Persica, 8.
pinnata, 8.
plena, 5, 6.
pteridifolia, 8.
pubescens, 3.
purpurea, 6.
rosea, 2.
Rothomagensis, 7.
rubra, 1, 6, 7.
Sibirica, 10.
Sougeana, 7.
Steencruysii, 8.
Varina, 7.
villosa, 2, 3.
violacea, 6.
vulgaris, 6.

A. *Tube of corolla much longer than calyx: anthers sessile, not exserted.*
  B. *Panicles on leafy branches, usually terminal: lvs. whitish beneath.*
    C. *Stamens inserted near the middle of the tube* .... 1. **Josikæa**
    CC. *Stamens inserted near the mouth of the tube* .... 2. **villosa**
  BB. *Panicles from lateral buds, without lvs.: terminal bud of branches suppressed.*
    C. *Under side of lvs. grayish green, pubescent at the midrib when young* .... 3. **pubescens**
    CC. *Under side of lvs. green, quite glabrous.*
      D. *Lvs. truncate or cordate at base.*
        E. *Shape of lvs. roundish or broadly ovate* ...... 4. **oblata**
        5. **hyacinthiflora**
        EE. *Shape of lvs. ovate* .... 6. **vulgaris**
      DD. *Lvs. narrowed toward the base.*
        E. *Shape of lvs. ovate-lanceolate* .... 7. **Chinensis**
        EE. *Shape of lvs. lanceolate.* 8. **Persica**
AA. *Tube short, little longer than calyx: stamens exserted: fls. white. Ligustrina.*
  B. *Base of lvs. usually narrowed.* 9. **Pekinensis**
  BB. *Base of lvs. usually rounded.*
    C. *Plant a shrub* ....10. **Amurensis**
    CC. *Plant a tree* ....11. **Japonica**

1. **Josikæa,** Jacq. Shrub, attaining 12 ft., with upright, stout, terete branches: lvs. broadly elliptic to elliptic-oblong, acute at both ends, finely ciliate, dark green and shining above, glabrous or pubescent on the midrib beneath, 2½–5 in. long: fls. violet, short-pediceled or almost sessile, clustered, in rather narrow panicles 3–7 in. long; stamens inserted somewhat above the middle of the tube; sepals half-upright. June. Hungary. B.M. 3278. B.R. 20:1730.—Less handsome than most other species, but valuable for its late blooming season. Var. **pállida,** Hort., has pale violet fls.; var. **rùbra,** Hort., reddish violet.

2. **villòsa,** Vahl, not Decne., nor Hooker, nor Koehne. Figs. 2450, 2451. Bushy shrub, 8 ft. high, with rather stout, upright, terete and warty branches: lvs. broadly elliptic to oblong, acute at both ends, finely ciliate, bright green and dull above, pubescent on the midrib or glabrous beneath, 3–7 in. long: fls. pinkish lilac or whitish, short-pediceled, in broad or somewhat narrow panicles, 3–7 in. long; stamens inserted near the mouth; sepals half-upright. May, June. China to Himalayas. The common form, var. **ròsea,** Cornu (*S. Brètschneideri,* Lemoine), has broadly elliptic or elliptic lvs. and pink fls. in rather large panicles with leafy bracts at the base. R.H. 1888:492. G.F. 1:521. Gn. 39, p. 91. Gt. 44, p. 500. Var. **Emòdi,** Rehd. (*S. Emòdi,* Wall.), has narrow elliptic to oblong lvs., more whitish beneath; fls. whitish or pale lilac, in rather narrow panicles, usually with large lvs. at the base. Himalayas. B.R. 31:6. R.H. 1876, p. 368. Gn. 39, p. 106. Not quite hardy north. There are also vars. with yellow lvs. (var. **àurea,** Sim.-Louis) and with yellow variegated lvs. (var. **aureo-variegàta,** Hort.). Hybrids with *S. vulgaris* and *S. Josikæa* have been raised at the Botanic Garden at Paris.



2455. Syringa Persica, one of the common Lilacs (× ½).

3. **pubéscens,** Turcz. (*S. villòsa,* Decne., not Vahl. *S. villòsa,* var. *ovalifòlia,* DC.). Shrub, 6 ft. high, with slender, somewhat quadrangular branches: lvs. roundish ovate to rhombic-ovate or ovate, shortly acuminate, ciliate, dark green above, 1–3 in. long: fls. pale lilac, fragrant, short-pediceled, in ovate, not very large, but numerous panicles; tube very slender; apex of anthers not reaching the mouth. May. N. China. G.F. 1:415; 6:266. B.M. 7064 (as *S. villosa*).—Free-flowering shrub of graceful habit, with handsome dark foliage.

4. **oblàta,** Lindl. Shrub or small tree, 12 ft. high: lvs. roundish ovate or reniform, often broader than long, cordate, short-acuminate, bright green, 2½–4½ in. across: fls. purple-lilac or purple-violet, in rather loose, pyramidal panicles, 3–6 in. long; pedicels about as long

as calyx. May. N. China. G.F. 1:221. A.G. 22:183.—The earliest of all to bloom and handsome, with its vinous red foliage in fall. Var. **álba**, Hort., has white flowers.

5. **hyacinthiflòra**, Hort. (*S. oblata* × *vulgaris*). Intermediate between the parents, with broadly ovate lvs., turning purplish in fall. Only known in the double form, var. **plèna**, Lemoine. Many or perhaps most of the newer double-flowered vars. have originated by recrossing this form with vars. of *S. vulgaris*.

6. **vulgàris**, Linn. Figs. 2453, 2454. Upright shrub or small tree, 20 ft. high: lvs. ovate, truncate or slightly cordate, acuminate, bright green, 2–4 in. long: fls. lilac, blue, purplish or white, in large panicles. May. Southeastern Europe to Caucasus and Afghanistan; sometimes escaped from gardens in the eastern states. B.M. 183. Gn. 53, p. 156. M.D.G. 1899:205.—The most important of the older original vars. are the following: Var. **álba**, Dietr., branches yellowish gray: fls. white: buds yellowish green; blooms a week earlier than the other vars. A.F. 12:1081. Var. **cærùlea**, Dietr. Fls. blue, in rather loose panicles. Var. **purpùrea**, DC. (var. *rùbra*, Loud.). Fls. purplish red, in large and rather dense panicles. Here belong also var. **Marlyénsis**, Hort., and Charles X. Var. **violàcea**, Dietr. Fls. violet-lilac, in rather loose panicles. Var. **plèna**, Hort. With double fls. There are several vars. with variegated lvs., but these are hardly worth cultivating.

7. **Chinénsis**, Willd. (*S. Persica* × *vulgaris*. *S. dùbia*, Pers. *S. Rothomagénsis*, Loud. *S. Varìna*, Dum.-Cours.). Shrub, attaining 12 ft., with slender, often arching branches: lvs. ovate-lanceolate, acuminate, 2–4 in. long: fls. purple-lilac, red or white, in large and broad panicles. May. Originated in 1777 in Rouen, France. R.H. 1883, p. 80. F. 1873, p. 76 (as *S. Persica*).—Very free-flowering. Var. **álba**, Loud., with white fls. Var. ✓ **Meténsis**, Sim.-Louis, with pale purplish fls. Var. **Saugeàna**, Loud. (var. *rùbra*, Lodd.), with deep purplish red fls. Var. **dùplex**, Lemoine, with double purplish lilac flowers.

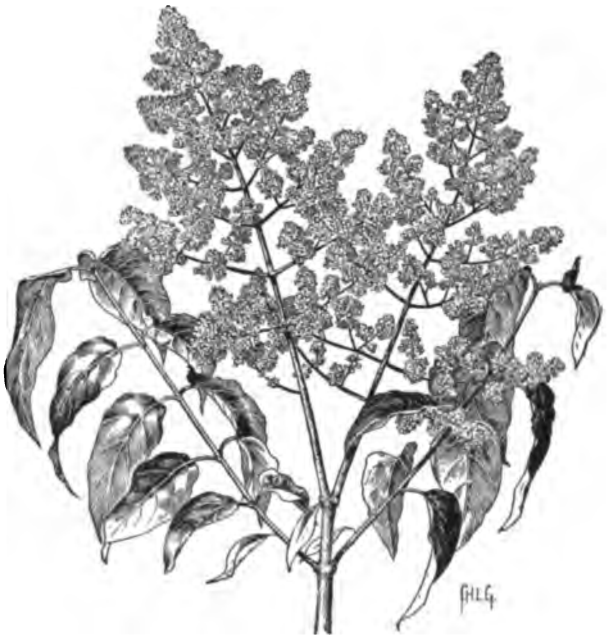
8. **Pérsica**, Linn. Fig. 2455. Shrub, attaining 5–10 ft., with slender, arching branches: lvs. lanceolate, acuminate, 1½–3 in. long: fls. pale lilac or whitish, in rather loose, broad panicles, about 3–4 in. long; pedicels as long as or longer than calyx. May, June. Caucasus to Afghanistan. B.M. 486.—Var. **álba**, Loud. (*S. Steèncruysii*, Hort.). Fls. white. Var. **laciniàta**, Vahl (*S. pteridifòlia*, *filicifòlia* and *pinnàta*, Hort.). With pinnately lobed or pinnatifid lvs., of dwarfer habit and with smaller panicles. R.H. 1878, p. 452, 453; 1883, p. 80; 1901, pp. 40, 41.

9. **Pekinénsis**, Rupr. (*Ligustrìna Amurénsis*, var. *Pekinénsis*, Maxim. *Ligustrìna Pekinénsis*, Regel). Large shrub, attaining 15 ft., with slender, spreading branches, brownish red when young: lvs. ovate to ovate-lanceolate, usually narrowed at the base, acuminate, rather dark green above, pale or grayish green and glabrous beneath, 2–4 in. long, 1–1½ in. broad: fls. yellowish white in large panicles, usually in pairs at the ends of branches; stamens about as long as limb. June, N. China. G.F. 3:165; 7:385. M.D.G. 1899:425.—Large shrub, of excellent habit, with handsome foliage retained until late in fall; flowers profusely only when older. Var. **péndula**, Hort. With very slender, pendulous branches.

10. **Amurénsis**, Rupr. (*S. ligustrìna*, Hort. *Ligustrìna Amurénsis*, var. *Mandshùrica*, Maxim. *Ligustrìna Amurénsis*, Regel). Shrub, attaining 12 ft., with spreading or upright branches: lvs. broadly ovate to ovate, usually rounded at the base, bright green above, pale or grayish green and glabrous beneath, 2–6 in. long, 1½–2½ in. broad: fls. yellowish white, in large, rather loose panicles; stamens almost twice as long as limb. June. Manchuria. Gt. 12:396; 45, p. 64. G.F. 2:271. Gn. 12, p. 623, 624. R.H. 1877, p. 453–455.—Sometimes cult. under the name *S. Sibírica* or *S. Sibirica alba*.

11. **Japónica**, Decne. (*Ligustrìna Amurénsis*, var. *Japónica*, Maxim.). Fig. 2456. Pyramidal tree, attaining 30 ft., with upright branches: lvs. broadly ovate to broadly elliptic, rounded or slightly cordate at the base, shortly acuminate, pale green beneath, and usually pubescent when young, 3–7 in. long: fls. yellowish white, in very large panicles often 1 ft. or more long; stamens little longer than limb. June, July. Japan. B.M. 7534 (as *S. Amurensis*). G.C. II. 25:561. G.F. 2:293, 295. D.G.M. 1899:424. Gt. 37:217. Mn. 4, p. 5; 7, p. 167. R.H. 1894, p. 325.—Very desirable free-flowering tree and quite hardy north. Var. **argéntea**, Temple, has the lvs. variegated with silvery white.

ALFRED REHDER.



2456. Syringa Japonica (× ¼).

T

TABEBUÌA (Brazilian name). *Bignoniàceæ.* Ornamental evergreen trees with opposite, long-petioled, simple leaves and showy flowers in terminal, few-fld. racemes. Only *T. leucoxyla* seems to be introduced. It requires the same cultivation as the tropical species of Tecoma, which see. The genus contains 5 or 6 species, inhabitants of tropical America, closely allied to Tecoma, but, according to recent monographs, chiefly distinguished by the simple leaves and the irregularly splitting tubular calyx; formerly also species with digitate foliage were included, for which see *Tecoma*.

leucóxyla, DC. (*Bignònia leucóxyla*, Vell. *B. pállida*, Lindl.). Evergreen tree or shrub: lvs. elliptic-oblong to obovate-oblong, obtuse or sometimes emarginate at the apex, glabrous, dark green with distinct pale midrib, 4–7 in. long: fls. in few-fld. terminal racemes; corolla funnel-shaped, about 2 in. long, with yellow tube and pale lilac limb. Brazil. B.R. 12:965.

Alfred Rehder.

TABERNÆMONTÀNA (J. T. Tabernæmontanus of Heidelberg, physician and botanist, author of Krauterbuch mit Kunstlichen Figuren; died 1590). *Apocynàceæ.* A genus of more than 100 species of trees or shrubs widely scattered in tropical regions. Lvs. opposite, penni-nerved: fls. white or yellow, in terminal or sometimes apparently but not truly axillary cymes; calyx usually short 5-lobed or parted; corolla salverform; stamens inserted on the corolla-tube, included: berries large and globose or small, oblique and recurved. See *Gonioma* for distinctions from that genus.

A. *Fls. white.*

coronària, Willd. Crape Jasmine. Nero's Crown. A tender shrub, 6–8 ft. high: lvs. glossy green, oblong to oblanceolate: fls. white, fragrant, 1–2 in. across, in 1–8-fld. clusters in the forks of the branches; petals crimped on the margin, whence the common name. Cult. in India but native country unknown. Var. **flòre-plèno**, with double, somewhat larger, very sweet-scented flowers, seems to be far more common in cultivation. P.M. 16:354. B.M. 1865 (as *Nerium coronarium*).—Cult. in the more southern states and also in greenhouses. Also known as Adam's Apple and East Indian Rosebay.

AA. *Fls. yellow.*

grandiflòra, Jacq. A small, tender shrub: lvs. oblong-ovate, sharply acuminate, 2–3 in. long, thick: fls. single, yellow, 1–2 in. long, in few-fld. clusters; corolla-lobes oval, obtuse, entire. Early fall. Carthagena, Guiana. B.M. 5226.—Rarely cult. in the more southern portions of the United States.

T. Camássi, Regel. See Gonioma Kamassi.

F. W. Barclay.

The East Indian Rosebay, *Tabernæmontana coronaria*, is one of the best ornamental shrubs for subtropical gardens. This species and *T. Camassi*, referred in this work to Gonioma, flourish everywhere in Florida from Jacksonville southward. If they receive proper attention, tiny cuttings soon develop into dense, bushy plants 3–5 ft. high, covered with deliciously scented flowers throughout the summer. Indeed the plants are so densely covered with buds and flowers that it is often difficult to find a sufficient supply of cuttings for propagation. *T. coronaria* has larger leaves than *T. Camassi* and the flowers are much like those of the double white oleander, while *T. Camassi* has solider and smaller blossoms. Both do well under the same treatment. In order to enjoy the beauty of the East Indian Rosebay to its fullest extent, it must be planted in rich, sandy soil, not too wet and not too dry, and in places fully exposed to the sun. Only very strong pot-grown plants should be set out in the garden. This should be done during the rainy season. Avoid breaking the ball in transplanting. It is useless to transplant in November, the time when most evergreens and other plants are most successfully set out. The plants at this season have no time to become established before the first sharp frost comes, and a weakened Tabernæmontana is usually killed outright by even a slight frost. Just before Christmas all the plants of this nature (bauhinias, cestrums, *Poinciana regia*, *Tristania conferta*, grevilleas, eucalypti, etc.) are banked about 18 inches to 2 feet high with dry sand, and they always come through without much damage. In April or even earlier, the banking is taken away and the plants cut back to sound wood. The Tabernæmontanas look best in groups by themselves or in front of other glossy-leaved evergreens.

H. Nehrling.

TACAMAHAC. *Populus balsamifera.*

TÁCCA (Malayan name). *Taccàceæ.* A genus of 9 species from tropical regions. Perennial herbs from a tuberous or creeping rhizome with large, radical, petioled leaves and umbels of lurid brown or greenish flowers in a dense umbel borne on a leafless, rigid scape. The flower-cluster is subtended by a few, usually 4, leaf-like or colored bracts, and intermixed with the flowers are more or less numerous, long and conspicuous, sterile, filiform pedicels, which usually droop below the flower-cluster.

A. *Lvs. much lobed.*

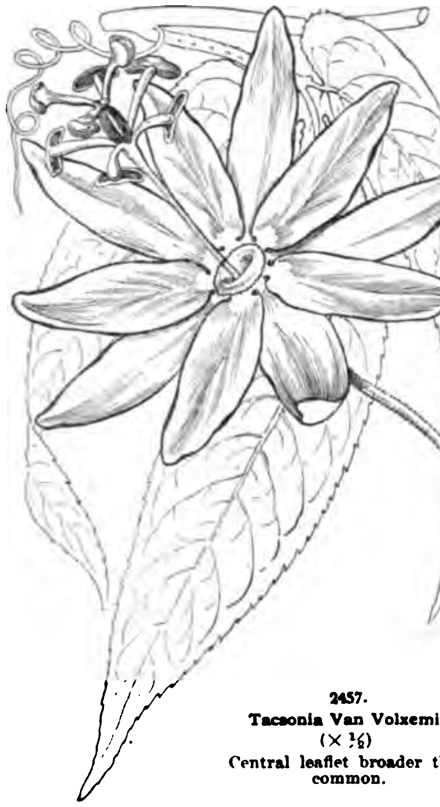
pinnatífida, Jack. Tender perennial herb, about 2 ft. high: rootstock globose, becoming 1 ft. through: lvs. large, usually 3-branched, the divisions pinnately cut or divided, the ultimate lobes sometimes irregular and unequal but usually ovate to lanceolate: fls. greenish, 8 lines across, many with the sterile pedicels purplish: berry nearly globular, 1 in. through. Afr., India and Australia. L.B.C. 7:692. B.M. 7299; 7300.—According to Von Mueller's Select Extra-tropical Plants, the Fiji Arrowroot is prepared from the tubers of this species. The plant thrives even on the sand-shores of tropical countries, and it is not unlikely that it will endure a temperate climate.

AA. *Lvs. not lobed.*

cristàta, Jack. (*Atáccia cristàta*, Kunth). Rootstock a short conic caudex, marked with leaf-scars: lvs. 1–2 ft. long, oblong, acuminate, dark purplish green: scape longer than the lvs.: fls. dark purple, 1½ in. across, in a somewhat one-sided umbel, with numerous pale sterile pedicels 8–10 in. long: involucral bracts 4, conspicuous, the 2 inner elliptical, narrowed to a petiole, the 2 outer revolute. Malaya. B.M. 4589. F.S. 9:860, 861. Gn. 45, p. 415; 49, p. 423.—It requires, according to Gn. 45, p. 415, a good, rich, open soil, with ample drainage, plenty of water, and a stove temperature. During the winter season the plant should be kept in a state of partial rest.

F. W. Barclay.

TACSÒNIA (from the Peruvian name of one of the species). *Passifloràceæ.* From Passiflora, Tacsonia differs in having a long-tubular calyx, styles 3, stamens and petals 3 or 5, the latter never wanting, corona of tubercles or very short threads, and in a short reflexed crown near the base of the flower-tube. However, the line of demarcation between the two genera is often not well marked and Harms (Engler & Prantl's "Pflanzenfamilien") unites Tacsonia with Passiflora. Masters accepts (Trans. Linn. Soc. 27) 25 species of true Tacsonia, relegating the intermediate forms largely to Passiflora. Other species have been discovered subsequently, making the total number in the genus above 30. The species are all South American, inhabiting the Andes. They are tendril-climbing shrubs or herbs, requiring the treatment given Passifloras. Tacsonias are cultivated freely in the open in middle and northern California.



2457. Tacsonia Van Volxemii. (× ½)
Central leaflet broader than common.

A. *Fls. orange or rosy orange.*

Párritæ, Mast. Lvs. deeply 3-lobed, glabrous above and pilose beneath, the lobes narrow and entire; stipules entire, subulate-acuminate: fl. with a long and slender tube, glabrous, swollen at the base; sepals winged and with points, rosy-orange; petals oblong and flat, shorter than the sepals, orange; corona double, the outer row of tooth-like projections. Colombia. G.C. II. 17:225. I.H. 35:41.—Named for Senor Parra, through whom it was introduced.

AA. *Fls. scarlet or rose-colored.*

B. *Bracts beneath the flower not united.*

C. *Lvs. simple or not lobed.*

insignis, Mast. Pilose: lvs. ovate-lanceolate, subcordate, dentate, rugose or blistered above and red-downy beneath, the stipules dissected: fl. about 6 in. across, violet, rose or crimson; tube cylindrical, swollen at the base, downy; sepals about twice longer than the tube, lance-oblong, spurred at the end; petals similar in shape, obtuse; corona of one series of short threads, blue and white. Probably Peruvian. G. C. 1873:1113. F. S. 20:2083–4. B.M. 6069.

CC. *Lvs. 3-lobed or divided.*

D. *Foliage glabrous at maturity.*

Van Vólxemii, Hook. Fig. 2457. Stems slender and slightly pubescent: lvs. cordate-ovate in outline, deeply 3-lobed, the lobes long-lanceolate-acuminate, serrate: fls. 5–7 in. across, bright red with short green calyx-tube that has a swollen base, the acute calyx-lobes green externally; corona an inconspicuous toothed rim. Colombia. B.M. 5571. G.C. 1866:171.—Probably the best known species and handsome, but less showy than some others.

Jàmesoni, Mast. Lvs. sub-orbicular, 3-lobed, glabrous: fl. large, bright rose or cherry red, with a cylindrical tube 4 in. long. Peru.

DD. *Foliage downy beneath at maturity.*

Exoniénsis, Hort. (hybrid of *T. Van Volxemii* and *T. mollissima*). Fig. 2458. Lvs. downy, cordate, ovate-oblong, divided nearly to base into 3 lanceolate, serrate segments: fls. 4½–5 in. across; sepals brick red outside, brilliant rose pink within; throat violet; tube white inside, 2½ in. long. Resembles *T. Van Volxemii* in having peduncles as long as lvs.: linear stipules; free downy bracts, filamentous corona near base of tube and violet color of throat.—Resembles *T. mollissima* in having downy lvs., long flower tube, color of fl. and aristate sepals.

BB. *Bracts beneath the flower more or less united.*

C. *Leaf-lobes short and obtuse.*

manicàta, Juss. Pubescent. lvs. broad-ovate to orbicular-ovate in outline, about 4 in. long, the oblong obtuse serrate lobes reaching to the middle of the blade: fl. 4 in. across, bright scarlet; tube ⅓ in. long, inflated and ribbed at the base; corona double, the outer series composed of blue hairs. Colombia and Peru. B.M. 6129.—*P. ignea,* Hort., is a form of this species.

CC. *Leaf-lobes long-acute.*

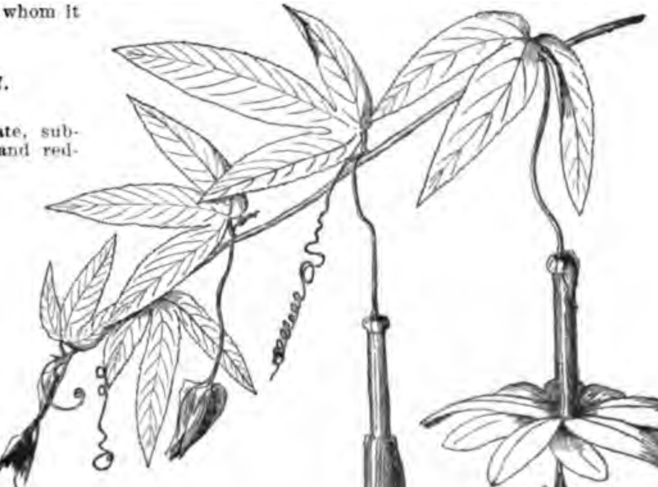
mixta, Juss. Glabrous or somewhat pubescent: lvs. orbicular-ovate, thick, 3-lobed to the middle, the lobes long-acute and serrate: fl. 3–4 in. across, rose-pink, the oblong sepals not equaling the green scarcely saccate tube; corona a short multiple rim or disk. Andes.

mollíssima, HBK. Pubescent: lvs. cordate-ovate in outline, very pubescent beneath, the lobes extending nearly to the base of the blade and ovate-lanceolate in shape and serrate, the stipules laciniate: fl. about 3 in. across, rose-color, the green tube exceeding the sepals and swollen at the base; corona a short rim. Andes. B.M. 4187. B.R. 32:11. F.S. 2:78.—*S. tubiflora,* offered in California, is said to be similar to this, but of deeper shade.

Smythiàna, Hort. Seedling of *T. mollissima* or hybrid with it, with very brilliant orange-scarlet or rosy-crimson fls. G.C. III. 12:704.

T. Buchánani, Lem. See Passiflora vitifolia, p. 1222. I.H. 14:519.—*T. floribúnda* was once advertised in the American trade, but it was probably not the T. floribunda, Masters, of Colombia.—*T. pinnatistípula,* Juss. Resembles T. mollissima, but the bracts are free; stipules pinnatisect: fls. rose-colored. Chile. B.M. 4062. B.R. 18:1536.

L. H. B.



2458. Tacsonia Exoniensis (× ⅓).

TAGÈTES (*Tagus*, an Etruscan god). *Compósitæ*. Marigold. A genus of some 20 species of tropical American herbs. Lvs. opposite, pinnately cut or rarely simply serrate: fls. of various sizes, yellow or orange, marked in some species with red. The popular annual species known as "African" and "French" Marigolds have been derived respectively from *T. erecta* and *T. patula*, both of which are native to Mexico. According to Sweet's Hortus Britannicus, these two species were introduced into cultivation in 1596 and 1573.

2459. Single French Marigold — Tagetes patula (× ⅓).

For garden purposes Tagetes may be divided into two groups, based upon habit of growth. *T. erecta* and *lucida* are of upright and somewhat open growth; while *T. patula* and *signata* are spreading and bushy, the lower branches lying close to the ground and often rooting.

The French Marigolds, *T. patula*, are valuable bedding plants. Good garden forms are of even height and bushy, compact growth, with a mass of good foliage and well-colored flowers appearing continuously from June until frost. In raising plants, it is preferable to grow them in pots, as this practice seems to check the plants sufficiently to cause them to bloom at a small size and more plentifully during the early summer months than if they were raised with unlimited root room. They should be planted about 1 ft. apart. This species also makes attractive specimens in small pots in a few weeks from seed. Mixed seed of the double sorts will give a large percentage of good double flowers, while the seed of special named double sorts is remarkably fine. Some of the single forms are very finely colored.

The African Marigolds, *T. erecta*, are not well suited to bedding purposes, the growth being too open, but for the mixed border or shrubbery they are excellent late-blooming subjects. This species should be grown with plenty of root room, air and rich soil from start to finish if the largest and most double flowers are desired. The African Marigolds are very useful as cut-flowers except under circumstances where their odor is objectionable.

For Pot Marigolds, see *Calendula*.

A. *Fls. generally marked with red.*

pátula, Linn. French Marigold. Fig. 2459. A hardy annual, usually about 1 ft. high and much branched from near the base, forming a compact, bushy plant: lvs. darker green than in *T. erecta*, pinnately divided; lobes linear-lanceolate, serrate: fls. smaller than in *T. erecta* and borne on proportionately longer peduncles. B.M. 150; 3830 (as *T. corymbosa*).—Both the single and double forms are grown. The species is very variable as to the color markings of the flowers, which range from almost pure yellow to nearly pure red.

AA. *Fls. not marked with red.*

B. *Lvs. pinnately divided.*

C. *Rays numerous.*

erécta, Linn. African Marigold. Fig. 2460. A hardy annual growing about 2 ft. high, erect, branched: lvs. pinnately divided, segments lanceolate-serrate: fls. 2–4 times as large as in *T. patula* and of one solid color, the typical color, according to DeCandolle, being a lemon-yellow.—The rays are sometimes rather two-lipped and in one of the garden forms they are quilled. The color ranges from a light sulfur-yellow to a deep orange, many of the light yellow shades being rare amongst flower colors. This is the common marigold of old gardens in America. Foliage very strong-scented.

CC. *Rays few, usually 5.*

signàta, Bartl. An annual branching species: lvs. pinnately divided into usually 12 oblong, linear, sharply serrate segments, the lower teeth awned: rays 5, yellow, roundish-obovate. Var. **pùmila**, Hort., a dwarf, bushy form, usually less than 1 ft. high, seems to be the only form in the trade. The flowers are bright yellow and small but numerous.—The species is suited for massing or for borders. R.H. 1895, p. 505.

BB. *Lvs. lanceolate, simply serrate.*

lùcida, Cav. Sweet-scented Marigold. A tender perennial plant, entirely distinct from the foregoing annuals in the sessile, lanceolate lvs. and small, usually 2–3-rayed fls. in dense, terminal corymbs. The flowers have a much more agreeable odor than the other species cultivated. Chile. B.M. 740. R.H. 1895, p. 505.—Sometimes used as a substitute for Tarragon, which see.

T. lácera is a species discovered about 1896 by T. S. Brandegee in Lower California. It makes a compact bush 4–5 ft. high, bearing a profusion of yellow flowers borne in winter. Small plants flower well in pots. See G.F. 9:67.

F. W. Barclay.

2460. African Marigold — Tagetes erecta (× ⅓).

TALAÙMA (South American name). *Magnoliàceæ*. *Talauma Hodgsoni* is an excellent, magnolia-like, tender evergreen tree with cup-shaped flowers fully 6 inches across and 4 inches deep. It blooms in April. The flowers have a spicy odor, hard, thick, fleshy texture, and the glaucous purplish blue of the sepals contrasts finely with the ivory white of the petals. This species is a native of the Himalayas, a region which is perhaps richer in handsome magnolia-like trees than any other area of equal size in the world. Hooker ranks this species second in beauty only to *Magnolia Campbelli*. *T. Hodgsoni* grows at an elevation of 5,000 to 6,000 feet.

This fine tree has been flowered at Kew and perhaps elsewhere in Europe, but never in America, so far as is known. Time and time again seeds were received at Kew from India, but they never germinated, the reason being the rapid decay of the albumen, involving that of the embryo. The trees now cultivated in Europe have been derived from young plants sent from India in Wardian cases at considerable expense and risk.

Talauma is closely allied to Magnolia, but the carpels are indehiscent and deciduous, while those of Magnolia dehisce dorsally and are persistent. Talauma is a genus of about 15 species of trees and shrubs, mostly natives of the tropics of eastern Asia and South America; also Japan. Leaves, inflorescence and seeds as in Magnolia: sepals 3; petals 6 or more in 2 or more whorls; stamens very numerous, in many series: ovaries indefinite, 2-ovuled, spiked or capitate; carpels woody, separating from the woody axis at the ventral suture and leaving the seeds suspended from the latter by an elastic cord.

Hódgsoni, Hook. & Thom. Tender, evergreen tree, 50–60 ft. high, producing lvs. and fls. at the same time: lvs. 8–20 x 4–9 in., obovate-oblong, cuspidate or obtuse, leathery, glabrous: fls. solitary, terminal; sepals 3–5, purple outside; petals about 6: fr. 4–6 in. long. Himalayas. B.M. 7392. W. M.

TALÌNUM (possibly a native name in Senegal). *Portulacàceæ*. A dozen or more species of fleshy herbs widely scattered in the warmer regions. With age they sometimes become woody at the base. Lvs. alternate or subopposite, flat: fls. small, in terminal cymes, racemes or panicles, rarely solitary, axillary or lateral; sepals 2; petals 5, hypogynous, ephemeral; stamens 5–many: ovary many-ovuled; style 3-cut or 3-grooved at apex; capsule globose or ovoid, chartaceous, 3-valved; seeds subglobose or laterally compressed, somewhat kidney-shaped, shining.

pàtens, Willd. Erect subshrub: stem almost simple, 1–2 ft. high, leafy to the middle, where the panicle begins: lvs. mostly opposite, oval, abruptly tapering at the base: panicle terminal, long, leafless, bearing dichotomous cymes: fls. carmine; petals 3 lines long; stamens about 15–20. West Indies and east coast of S. Amer. to Buenos Ayres. Var. **variegàtum**, Hort. ("*Tolinium variegatum*," Hort. *Basélla variegàta*, Hort.), is the plant described as Sweet Malabar Vine in Vol. I, page 133, of this work. W. M.

triangulàre, Willd. Lvs. alternate, obovate-lanceolate: cymes corymbiferous: pedicels 3-cornered (in *T. patens* they are filiform): fls. red or white. West Indies. Brazil. Peru. Var. **crassifòlium**, Hort. (*T. crassifòlium*, Hort.), is said to be taller and more branched: lvs. larger, often emarginate and mucronate.

Talinum patens, var. *variegatum*, is a handsome greenhouse shrub, with foliage marked white and sometimes also pink. The young stems are pink and succulent, but they become woody with age. The plant is allied to Portulaca and will endure much heat and drought, but is very impatient of overwatering and lack of drainage. The plants bloom freely, the fls. being small, light pink and followed by small, yellow capsules filled with an indefinite number of little brown seeds. Some prefer to retain the sprays of blossom, but to make the best show of foliage the flower-shoots should be cut off as soon as they appear. Talinum is a satisfactory house plant. It should be placed in a window with a northern exposure or in some other shady position. Talinum may also be planted out during the summer. W. C. STEELE.

TALIPOT PALM. See *Corypha umbraculifera*.

TALLOW SHRUB. *Myrica cerifera*. **TALLOW TREE, Chinese.** *Sapium sebiferum*.

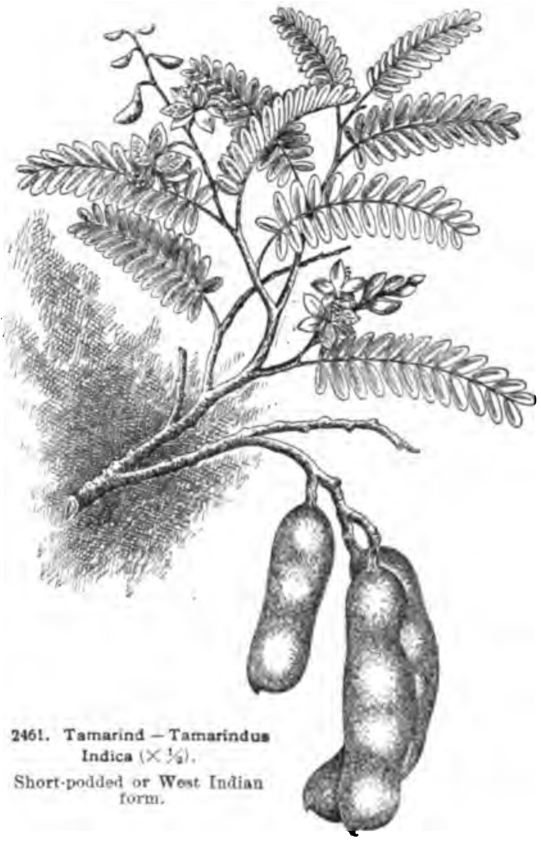
TALLOW WOOD. *Eucalyptus microcorys*.

TAMARACK. See *Larix*.

TAMARIND. See *Tamarindus*.

TAMARÌNDUS (From Arabic, meaning "Indian date"). *Leguminòsæ*. The TAMARIND, Fig. 2461, is an exceptionally beautiful and useful tropical tree. It attains a great height, has acacia-like foliage and yellow flowers about an inch across in clusters of 8 or 10. The Tamarind is cultivated everywhere in the tropics but its native country is uncertain, probably either Africa or India. As an ornamental shade tree it is considered by travelers as one of the noblest in the tropics. Hooker has well described its "vast, dense and bushy head of branches, thickly clothed with light and feathery foliage." The Tamarind is grown out of doors in southern Fla. and Calif. and young plants are said to be desirable for the decoration of windows and conservatories in northern countries.

The pods of the Tamarind, which are thick, linear and 3–6 in. long, contain a pleasant acid pulp much used throughout the tropics as the basis of a cooling drink. The pulp is also used in medicine, being rich in formic and butyric acids. It is laxative and refrigerant, and is also used to prepare a gargle for sore throat. The pulp of the Tamarind is generally called the "fruit" or "Tamarind" and the pod is spoken of as the "shell." In the East Indies the shell is removed and the pulp simply pressed together into a mass. The Tamarinds of the Malayan Archipelago are considered better than those of India. They are preserved without sugar, being merely dried in the sun. They are exported from one island to another and when sent to Europe are cured in salt. In the West Indies the fruit is prepared by removing the shell and placing alternate layers of fruit and sugar in a jar and then pouring boiling syrup over the mass. McFadyen says that in



2461. Tamarind — Tamarindus Indica (× ½).
Short-podded or West Indian form.

order to prevent fermentation, the first syrup, which is very acid, is poured off and a second is added. Also that an excellent preserve is imported from Curaçoa, which is made from the unripe pods preserved in sugar with the addition of spice. The East Indian Tamarind has long pods; the West Indian short ones.

The Tamarind tree yields a handsome furniture wood. It is yellowish white, sometimes with red streaks, hard and close-grained; heart-wood dark purplish brown.

Botanically, the flower of the Tamarind is rather difficult to understand. It is far removed from the sweet pea type, which is the one a northerner commonly thinks of as typical of the legume family. At first glance it is a pale yellow flower about an inch across with 6 or 7 petals, of which 3 are veined with red. On closer study it seems that 4 of the showy parts are sepals, which are all pale yellow. The three red-veined parts are petals, while the other two petals that the student expects to find, are reduced to mere bristles hidden in the flower at the base of the staminal tube. Only 3 of the stamens are fertile, the other 6 being small and rudimentary. These floral characters distinguish Tamarindus from allied genera, of which only Schotia seems to be cult. in America.

Tamarinds can be raised from cuttings but more easily by seeds, although they are of slow growth.

Índica, Linn. (*T. officinàlis*, Hook.). TAMARIND. Fig. 2461. Tender evergreen tree, attaining a height of 80 ft., with a circumference of 25 ft.: lvs. abruptly pinnate; lfts. 20–40, opposite, oblong, obtuse: fls. pale yellow, the petals veined with red. B.M. 4563. — The fls. are said to vary to white or pinkish.

W. HARRIS, E. N. REASONER and W. M.

2462. Tamarix parviflora. (× ½.)

TAMARISK. See *Tamarix*.

TÁMARIX (ancient Latin name). *Tamariscàceæ*. TAMARISK. Ornamental shrubs or trees, with minute, alternate, scale-like leaves and small, usually light pink flowers in racemes or terminal panicles, followed by small capsular fruits. None of the species are quite hardy north, but *T. Odessana*, *Gallica* and *parviflora* are fairly hardy as far north as Mass. The Tamarisks are all of graceful and distinct appearance, with light and feathery foliage and large, loose panicles of pinkish flowers. Several of the species bloom late in summer and are a welcome addition to our autumn-flowering shrubs. As they are inhabitants of warmer arid regions, they are well adapted for countries of similar climatic conditions. They are also excellent for seaside planting. They grow well in saline and alkaline soil and thrive in the very spray of the salt water. Prop. by seeds, which are very fine and should be only slightly covered, or usually by cuttings of ripened wood or greenwood cuttings under glass.

About 60 species from the Mediterranean region to E. India and Japan. Shrubs or trees: lvs. alternate, scale-like, often amplexicaul or sheathing: fls. small, short-pediceled or sessile, in rather dense racemes; sepals and petals 4–5; stamens usually 4–5, rarely 8–12, sometimes slightly connate at the base: ovary one-celled, surrounded at the base by a disk; styles 2–5: fr. a capsule, dehiscent into 3–5 valves; seeds many, minute, with a tuft of hairs at the apex. Several species have medicinal properties and yield dye-stuffs. The punctures of an insect, *Coccus manniparus*, cause *T. mannifera* to produce "manna."

T. Germanica, Linn., is now referred to the genus Myricaria, which is chiefly distinguished by the 10 stamens connate one-third to one-half, and by the 3 sessile stigmas. Ten species are known, all shrubby or suffruticose, with the fls. in terminal, often panicled racemes. *M. Germánica*, Desv., is a glabrous undershrub, 4–6 ft. high, with upright, wand-like branches: lvs. minute, bluish green, lanceolate, glandular-dotted: fls. light pink or whitish, in 4–6 in. long terminal racemes, usually with lateral ones at the base; stamens connate about one-half. M. and S. Eu., W. Asia. *M. Dahùrica*, Ehrenb. (*Tamarix Dahurica*, Willd.), is very similar, but racemes usually solitary and stamens connate only one-third. Dahuria, Transbaikalia. The culture is the same as of Tamarix; they prefer sandy, moist soil.

INDEX.

(S. L. refers to supplementary list.)

Africana, 1.
Amurensis, S. L.
Anglica, 3.
arborea, 3.
articulata, S. L.
Canariensis, 3.
Caspica, S. L.
Chinensis, 5.
Dahurica, see paragraph above.
Gallica, 3.
Germanica, see paragraph above.
hispida, 7.
Indica, 3.
Japonica, 4.
juniperina, 4.
Kashgarica, 7.
Narbonnensis, 3.
Odessana, 6.
Pallasii, S. L.
parviflora, 1.
pentandra, 3.
plumosa, 4.
purpurea, 1.
tetrandra, 2.

A. *Fls. 4-merous: racemes lateral on last year's branches.*
B. *Petals spreading, persistent*.......1. **parviflora**
BB. *Petals erect, deciduous*.............2. **tetrandra**
AA. *Fls. 5-merous, usually in terminal panicles.*
B. *Lvs. glabrous.*
C. *Petals deciduous*.................3. **Gallica**
CC. *Petals persistent.*
D. *Racemes lateral*..............4. **juniperina**
DD. *Racemes panicled, terminal.*
E. *A tree*......................5. **Chinensis**
EE. *A shrub*....................6. **Odessana**
BB. *Lvs. pubescent*.....................7. **hispida**

1. **parviflòra,** DC. (*T. tetrándra*, var. *parviflòra*, Boiss. and Kotschy). Fig. 2462. Shrub or small tree, 15 ft. high, with reddish brown bark and slender spreading branches: lvs. ovate, acuminate, semi-amplexicaul, scarious at the apex when older: fls. pink, very short-pediceled, slender in racemes about 1 in. long, along last year's branches; petals spreading, persistent; calyx very small, sometimes only 3-parted; styles usually 3, much shorter than ovary. April, May. S. Eu. F.S. 9:898. R.H. 1855:401.—Often confounded with the following species, also with *T. Africana* and *Gallica* and cult. under these names. *T. tetrandra*, var. *purpurea*, probably belongs here.

2. **tetrándra,** Pall. Shrub or small tree, attaining 12 ft., with almost black bark: lvs. ovate-lanceolate, somewhat narrowed at the base, with diaphanous margin: fls. light pink or almost white, in racemes 1–2 in. long along last year's branches; disk purple, deeply 4-lobed; styles usually 4, about as long as ovary. April, May. S.E. Eu., W. Asia.—Doubtful whether in cultivation in this country; all plants seen under this name by the writer belong to the preceding species.

3. **Gállica,** Linn. (*T. pentándra*, Pall. *T. arbòrea*, Sieb. *T. Canariénsis*, Willd. *T. Anglica*, Webb). Shrub or small tree, with slender spreading branches: lvs. dull to bluish green, closely imbricated, rhombic-ovate, acute or acuminate, keeled, semi-amplexicaul, with scarious margin: fls. white or pinkish, almost sessile, in slender, panicled racemes; petals deciduous; filaments dilated at the base; disk usually deeply 5-lobed; styles 3. May–July. W. Eu. Mediterranean region to Himalayas; naturalized in S. Texas. Gn. 34, p. 329.—Var. **Índica,** Ehrenb. (*T. Indica*, Willd.). With slender, upright branches: lvs. dull green: racemes longer and slenderer: fls. pink; disk obscurely and

minutely 10-lobed. Himalayas. Var. **Narbonnénsis**, Ehrenb. Racemes short, almost sessile, lateral on the current year's branches. S.W. Europe.

4. **juniperina**, Bunge (*T. Japónica* and *T. plumósa*, Hort.). Shrub or small tree, attaining 15 ft., with slender spreading branches: lvs. green, oblong-lanceolate, acuminate, scaricus at the apex: fls. pinkish, in lateral racemes 1½–2½ in. long on last year's branches; pedicels shorter than calyx; sepals ovate-lanceolate, little shorter than the persistent petals; disk 5-lobed, with emarginate lobes. Japan, N. China. S.Z. 1:71 (as *T. Chinensis.*)

2463. Tansy — Tanacetum vulgare (× 1-5).

5. **Chinénsis**, Lour. Shrub or small tree, attaining 15 ft., with slender spreading, often drooping branches: lvs. bluish green, lanceolate, acuminate, keeled: fls. pink, in large and loose usually nodding panicles, pedicels as long as calyx; sepals ovate, much shorter than the persistent petals; disk deeply 10-lobed. China.

6. **Odessàna**, Stev. Shrub, 4–6 ft. high, with upright, slender branches: lvs. lanceolate, subulate, decurrent: fls. pink; racemes slender, about 1 in. long on short, naked peduncles, spreading and disposed in ample loose panicles; pedicels about as long as calyx; petals slightly spreading; disk 5-lobed, with rounded lobes. July–Sept. Caspian region.

7. **hispida**, Willd. (*T. Kashgárica*, Hort.). Shrub, with slender upright branches: lvs. bluish green, cordate and subauriculate at the base, acuminate, somewhat spreading, finely pubescent: fls. pink, almost sessile, in dense racemes 2–3 in. long, disposed in terminal panicles; petals deciduous, much longer than sepals; disk 5-lobed. Aug., Sept. R.H. 1894:352.

T. articulàta, Vahl. Tree, attaining 30 ft., with slender, jointed branches: lvs. glaucous, minute, sheathing: fls 5-merous, pink, sessile, in terminal panicles. W. Asia. Not hardy north.—*T. Pállasii*, Desv. Shrubby and very similar to T. Odessana, but panicles less spreading, with more upright racemes: petals upright: disk 5-lobed, with emarginate lobes. Aug., Sept. S. Russia and W. to C. Asia. T. Amurensis, Hort., is a form of this very variable species. T. Caspica, not seen in bloom by writer, may also belong here. ALFRED REHDER.

TANACÈTUM (name of doubtful derivation). *Compósitæ*. A genus of 30 species of annual or perennial herbs scattered about the northern hemisphere, of which 7 are native to North America. They are odorous plants with alternate, variously cut leaves and small to medium-sized heads of yellow flowers disposed in corymbs, or rarely solitary. Fl.-heads heterogamous, disk-shaped: female fls. with 3–5-toothed, tubular corollas; akenes 5-ribbed or 3–5-angular, with a broad truncate summit, bearing a coroniform pappus or none. For culture, see *Tansy*.

vulgàre, Linn. TANSY. Fig. 2463. Stem robust, erect, 2–3 ft., leafy to the summit: lvs. pinnately divided into linear-lanceolate segments which are serrate or pinnately cut: fl.-heads ¼–½ in. across, numerous, in a dense, flat-topped cyme. July–Sept. Europe. Adventive in the eastern U. S.—Var. **crispum**, DC., has the leaves more cut and crisped. According to B.B. 3:460, this variety is in some places more common than the type. F. W. BARCLAY.

TANGIERINE. See *Orange* and *Citrus*

TANGIER PEA, Scarlet. *Lathyrus Tingitanus.*

TANSY (*Tanacetum vulgare*, Linn.). Fig. 2464. A coarse-growing, herbaceous perennial naturalized from middle Europe, and a familiar occupant of our old gardens, waste places and roadsides. Its common name is said to be derived from *athanasia*, immortality, an idea suggested to the ancient Greeks by the characteristic permanent possession it takes of the soil. Its annual, upright, usually unbranched stems, which rise about 3 feet from the perennial root, bear greatly divided, deeply cut, compound, bitter, aromatic leaves and rather dense corymbs of numerous small yellow flower-heads which appear in midsummer. The seed, which is small, is marked by 5 rather prominent grayish ribs and retains its vitality for about two years. Formerly its leaves were in great favor as a seasoning for various culinary preparations, especially puddings and omelettes, uses now almost obsolete. By the medical profession, its tonic and stimulant properties and its efficacy in hysterical and dropsical disorders are still recognized, though other medicines are more popular. In domestic practice it played an early role as an anthelmintic and stomachic and is still somewhat popular as a local agent to relieve the pain of muscular rheumatism, bruises and chronic ulcers. The wild plants usually satisfy all demands, but when no wild supply is at hand seed may be used to start the half-dozen specimens that a family should need. Easily started, readily transplanted or divided, Tansy requires no special care in cultivation except to keep it clear of weeds and to prevent its spreading and thus becoming troublesome as a weed. It will thrive in almost all soils and situations that are not too wet. For botanical account, see *Tanacetum*.

M. G. KAINS.

2464. The fern-like spray of Tansy.

TAPE GRASS. *Vallisneria.*

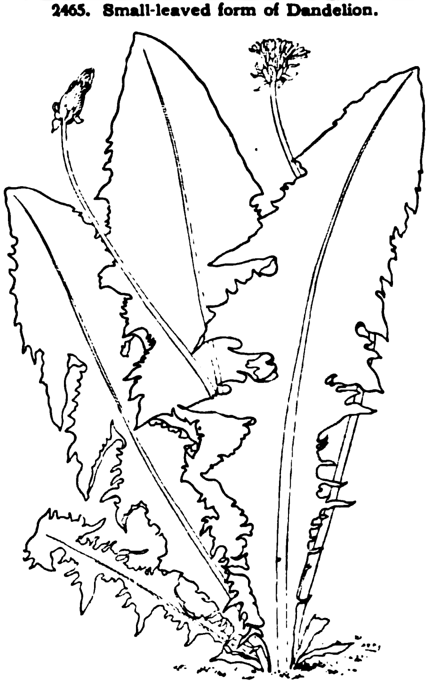
TAPIOCA. See *Manihot.*

TARÁXACUM (ancient name of doubtful origin, probably associated with supposed medicinal properties). *Compósitæ*. DANDELION. Low nearly or quite stemless herbs of cold and temperate regions, mostly of the northern hemisphere. The plants are exceedingly variable and there are consequently great differences of opinion as to the number of species. Bentham &

Hooker would reduce them to about 6, and others would retain 25 or more. Taraxacums are distinguished by having large many-flowered ligulate yellow heads solitary on naked and hollow scapes; involucre with one inner series of erect narrow bracts and outer calyx-like spreading sometimes reflexed bracts; pappus simple and capillary, borne on a slender beak terminating a fusiform elongated angled akene; flowers opening in sunshine.

The common Dandelion is **Taráxacum officinàle**, known also as *T. Dens-leonis*. See *Dandelion*. It varies immensely in stature and form of leaves, as shown in Figs. 2465–68. For history, see Sturtevant, Proc. 6th Meeting Soc. Prom. Agr. Sci., and Amer. Nat., Jan., 1886. For an account of the red seeded Dandelion, **T. erythrospérmum**, see Fernald, Bot. Gaz. July, 1895:323. From the common Dandelion it differs in having smaller sulfur-yellow heads, smaller and very deeply cut leaves, outer involucral scales not reflexed and somewhat glaucous; akenes red or red brown and shorter beaked; pappus dirty white. It is known to occur in New England, New York and Pa.; perhaps naturalized from Europe.
L. H. B.

2465. Small-leaved form of Dandelion.


2466. Large-leaved form of Dandelion.

2467. Cut-leaved form of Dandelion.

TARE, TARES. To the modern English farmer the word "Tare" means the common vetch, *Vicia sativa*, although Tare is also applied loosely to other species of Vicia and Lathyrus, particularly *Vicia hirsuta*. The celebrated passage in Matthew xiii, 25, "His enemy came and sowed tares among the wheat,' refers probably to the darnel, *Lolium temulentum*. The original Greek word in Matthew is Zizania, a name which in botany refers to the wild rice. Darnel belongs to the grass family and its seeds were long thought to stupefy those who ate them unwittingly. Recent investigations have proved that darnel seeds have no narcotic properties.

TARRAGON (*Artemisia Dracunculus*, which see) is a close relative of wormwood (*A. Absinthium*). It is a perennial composite herb native of the Caspian Sea region and Siberia, and is cultivated as a culinary herb in western Europe. Its lanceolate, entire leaves and small, inconspicuous and generally sterile blossoms are borne upon numerous branching stems, 2–3 feet tall. Its green parts, which possess a delicate, aromatic flavor resembling anise, are widely used for seasoning salads and for flavoring vinegar, pickles and mustard. The essential oil of Tarragon and Tarragon vinegar are articles of commerce, the crop being grown extensively in southern France for this purpose. The former is obtained by distillation of the green parts, the latter by simple infusion in vinegar. The best time to gather the crop for distillation or infusion is when the first flowers begin to open, since the plants have then a larger percentage of oil than before or after. From 300 to 500 pounds of green parts, according to seasonal and other conditions, are needed to produce one pound of oil.

As cultivated Tarragon rarely produces viable seed, the plant is propagated by cuttings of both old and green wood and by division of the roots. Cuttings may be taken at any convenient time, but the best time for division is when the plants have just commenced to grow in the spring. Tenacious and wet soils should be avoided and only loams of medium texture and of poor quality in sunny situations chosen. The plants may be set, either in the spring or in the autumn, one foot apart and cultivated like sage or mint. The flower-stems should be removed as soon as seen, as this will force greater growth of leaves, etc. The green parts may be gathered at any time, after the plants have become established, and used fresh. Dried Tarragon is nearly as useful as green, but there is little market for it, less even than for the leaves. At the approach of winter, especially in cold and snowless climates, the stems should be cut down and the plants covered with litter or leaves. The position of the beds should be changed every three or four years. Tarragon is less cultivated in America than it deserves. Most of our Tarragon vinegar comes from France.

Tagetes lucida is much like Tarragon in flavor and has been used as a substitute for it.
M. G Kains.

TASMÁNNIA (after Abel Jansen Tasman, Dutch captain who discovered Van Dieman's Land or Tasmania). *Magnoliàceæ*. This genus is included under Drimys by Bentham and Hooker. A small genus of tender evergreen aromatic, glabrous trees or shrubs with simple, short-petioled leaves with transparent dots and terminal clusters of greenish yellow, rose or white flowers.

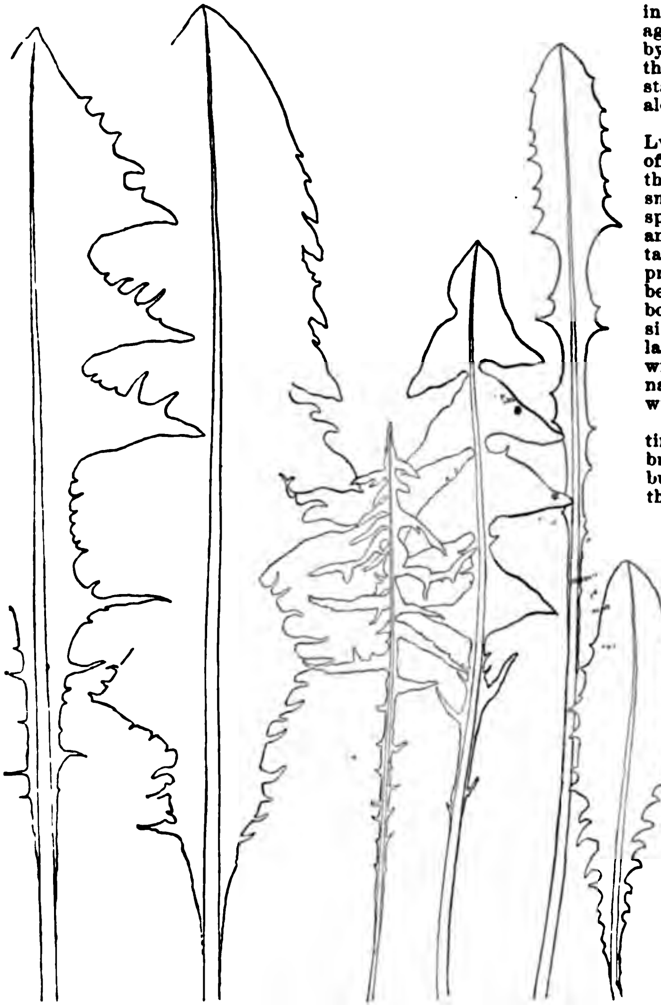
Drimys aromática, F. Muell. (*T. aromática*, R.Br.), is a shrub or small tree cult. in a few northern greenhouses: lvs. rather small, oblong to oblong-lanceolate, usually obtuse, narrowed to a short petiole: fls. ½–1 in. across, in small, terminal clusters. Spring. Tasmania. B.R. 31:43 (white, tinged pink).

F. W. Barclay.

TASSEL FLOWER. See *Emilia flammea* and *Brickellia.*

TAU-KOK BEAN. See *Dolichos.*

TAXÒDIUM (alluding to the similarity of the foliage to that of Taxus). *Glyptostròbus, Schubértia. Coniferæ.* Tall ornamental deciduous or evergreen trees, with distinctly 2-ranked, small, linear leaves and globose or ovoid cones not exceeding 1 in. across. The Bald Cypress, *T. distichum*, is well known in cultivation and is hardy as far north as New England. It is a very desirable tree for park planting. Its light green feathery foliage and the narrow pyramidal habit which it usually retains in cultivation give it a very distinct appearance. In its native habitat it forms in old age a broad, round-topped head sometimes 100 ft. across and has the trunk much enlarged at the base by huge, often hollow buttresses projecting in all directions and terminating in long, horizontal roots. From these roots spring the peculiar cypress knees, pyramidal protuberances composed of a very light, soft, spongy wood and spongy bark. These sometimes attain a height of 10 ft. and with age usually become hollow. From the under side of the horizontal roots large anchor-roots are sent perpendicularly into the earth and help to anchor the tree firmly in the swampy yielding soil. The knees are believed by some to be formed for the purpose of strengthening this root-system, since they are chiefly found opposite to the anchor-roots, but their main purpose is probably to bring air to the roots during the several weeks or months when the swamps are covered with water. The knees always grow high enough to rise above the surface of the water (see, also, G.F. 3, p. 2, 21, 22, 57).



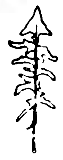
2468. Variation in foliage of the common Dandelion. All leaves drawn to the same scale.

The Bald Cypress thrives best in moist, sandy soil, but usually also does well in drier situations. The habit seems to depend somewhat on the degree of moisture; in drier soil the head is more narrow-pyramidal, in moist soil broader and more spreading. Propagated by seeds sown in spring and the varieties by grafting on seedling stock early in spring in the greenhouse; also by cuttings in sand constantly saturated with water or grown in water alone, under glass.

Three species in North America and China. Lvs. alternate, linear, usually 2-ranked, falling off in autumn or the second year together with the short lateral branchlets: fls. monœcious, small; staminate fls. catkin-like, consisting of spirally arranged anthers, with 4–9 anther-cells and forming terminal panicles; pistillate fls. solitary or in pairs at the ends of branchlets of the previous year, composed of imbricated scales bearing two ovules inside at the base: cone globose or nearly so, maturing the first year, consisting of spirally arranged woody scales enlarged at the apex into an irregularly 4-sided disk with a mucro in the middle and toward the base narrowed into a slender stalk; 2 triangular, winged seeds under each scale; cotyledons 4–9.

The Bald Cypress is one of the most valuable timber trees of North America. The wood is brown, light and soft, close and straight-grained, but not strong; it is easily worked, durable in the soil and much used for construction.

distichum, Rich. (*Cuprèssus disticha*, Linn. *Schubértia disticha*, Mirbel). Bald Cypress. Deciduous Cypress. Fig. 2469. Tall, deciduous tree, becoming 150 feet high, with a buttressed trunk usually 4–5, but sometimes attaining 12 ft. or more in diameter, usually hollow in old age; bark light cinnamon-brown, flaky; branches erect or spreading, distichously ramified, forming a narrow pyramidal head, becoming at maturity broad and rounded, with slightly pendulous branches: lvs. narrowly linear, acute, thin, light green, ½–¾ in. long: panicles of the purplish staminate fls. 4–5 in. long: cone almost globose, rugose, about 1 in. across and destitute of mucros at maturity: seed ¼ in. long. March–May. Del. to Fla., west to Mo. and Tex. S.S. 10:537. G.F. 3:7; 10:125. G.C. II. 11:372; 18:361; III. 7:325, 328; 14:659; 24:320. Gng. 2:225; 5:1. G.M. 39:875. M.D.G. 1896:303. S.H. 2:541.—An interesting natural variety is:



Var. **imbricàrium**, Nutt. (*T. distichum Sinénse péndula*, Lodd. *T. distichum*, var. *péndulum*, Carr. *Glyptostròbus péndulus*, Endl. *G. Sinénsis*, Hort.). Smaller tree, with slender upright or often pendulous branches clothed with spirally arranged, needle-shaped, more or less upright and appressed lvs. Occasionally found wild with the type and often cultivated. B.M. 5603. F. 1871, p. 60.

A great number of garden forms have been described, of which the following are the most important: Var. **fastigiàtum**, Knight. With slender, upright, virgate branches sparingly ramified. Var. **microphýllum**, Carr. Shrub, with short spreading branches; the lateral branchlets with typical foliage, those of the longer branches gradually passing toward the end into small, scale-like, imbricate lvs. Var. **nànum**, Carr. Dwarf, shrubby form, with numerous short branches. Var. **nùtans**, Ait. Branches spreading, long and slender, nodding at the tips. Var. **péndulum nòvum**, P. Smith. A graceful form with slender, pendulous branchlets. Var. **pyramidàtum**, Carr. Narrow pyramidal form with short ascending branches.

2469. Bald Cypress — Taxodium distichum.
(Natural size of lvs. is ½–¾ inch long.)

T. mucronàtum, A. Ten. (T. Mexicanum, Carr.). Tall tree, occasionally 170 ft. high, with a trunk 20 ft. or more in diameter: lvs. evergreen. Mex. G.F. 3:155. G.C. III. 12:647.—*T. heterophýllum*, Brongn. (Glyptostrobus heterophyllus, Endl.). Shrub, 10 ft. high: lower branches pendulous: lvs. linear and scale-like on the same plant: cones ovoid, ¾ in. long. China. Tender and rarely cult. Often confounded with vars. of T. distichum.

Alfred Rehder.

TÁXUS (ancient Latin name of the Yew). *Coniferæ.* Yew. Ornamental evergreen trees or shrubs, with 2-ranked linear leaves, insignificant flowers and showy berry-like red fruits. The best known species is *T. baccata*, which is hardy as far north as Rhode Island and northwestern New York, while *T. cuspidata* and *T. Canadensis* are considerably hardier and thrive as far north as Canada; the other species are little known in cultivation. The Yews are very desirable evergreens for park planting; they are densely clothed with dark green foliage and the pistillate plants are particularly beautiful in autumn when loaded with scarlet fruits. They are well suited for hedges and easily trimmed into any desired shape. They were formerly much used for fantastic topiary work (see e. g., G.C. II. 2:264, 265).

That the typical tree-like form of the Yew is nowadays not much planted is chiefly due to its slow growth, but the numerous mostly shrubby garden forms are popular plants for small gardens. The Yews thrive best in a moderately moist sandy loam and endure shade well. Large plants may be successfully transplanted if it is possible to secure a sufficient ball of earth with the roots. Prop. by seeds, which do not germinate until the second year, and by cuttings taken early in autumn and kept during the winter in a cool greenhouse or frame; the varieties also often by grafting on the type in early spring in the greenhouse, or sometimes by layers. Plants raised from cuttings grow much slower than grafted ones and cuttings of the type rarely grow into trees but usually into low-spreading shrubs (see M.D.G. 1898:565).

Six species are known. They are distributed through the northern hemisphere and in America south to Mexico. They are all very closely allied and could be considered geographical varieties of a single species. Trees or shrubs: lvs. linear, without resin-ducts, pale or yellowish green beneath, usually 2-ranked: fls. usually diœcious, solitary and axillary, rarely terminal, small, appearing in early spring; staminate globose, composed of 4–8 stamens each, with 3–8 anther-cells attached to the peltate connective; pistillate consisting of a single terminal ovule with several bracts at the base: seed a bony nut surrounded or almost inclosed by a fleshy cup-shaped scarlet disk; cotyledons two. The wood is heavy, hard, close-grained, strong, elastic and of reddish color. It is highly valued for cabinet-making and turning, and before the invention of gunpowder was in great request in England for the manufacture of bows. The foliage is poisonous to horses and cattle but the berries are not.

baccàta, Linn. Fig. 2470. Tree, attaining 60 ft., with a usually short trunk, occasionally 8 ft. or more in diameter: bark reddish, flaky, deeply fissured in old trees: branches spreading, forming a broad, low head; branchlets somewhat pendulous: lvs. 2-ranked, linear and usually falcate, shortly acuminate, with prominent midrib, dark green above, pale beneath, ¾–1¼ in. long or shorter in some vars.: fr. ⅓–½ in. across, with almost globose disk, about one-third longer than the ovoid brown seed. Eu. and N. Afr. to Himalayas. G.C. II. 23:309. Gn. 27, p. 578; 35, p. 36, 37. G.F. 9:265. Gng. 1:309.—Many garden forms have originated in cultivation; the following are the most important: Var. **adpréssa**, Carr. (*T. parvifòlia*, Wender. *T. brevifòlia*, Hort., not Nutt. *T. tardìva*, Laws. *T. Sinénsis tardìva*, Knight). Shrub or low tree of irregular habit, with long spreading branches: lvs. oblong, obtusish, mucronulate, ⅓–½ in. long: disk of fr. shorter than the seed. R.H. 1886, p. 104. Gn. 35, p. 37. Very distinct form. Var. **adpréssa erécta**, Nichols. (var. *adpréssa strícta*, Beissn.), has the foliage of the preceding, but erect branches forming a columnar bush. Var. **àurea**, Carr. (var. *Elvastonénsis aurea*, Beissn.). Lvs. golden yellow, more brightly colored at the tips and margin. This form has proved hardier than the type in New England. Var. **argéntea**, Loud. (var. *elegantíssima*, Hort.). Lvs. striped straw-yellow or sometimes whitish. Var. **erécta**, Loud. (var. *strícta*, Hort.). Bushy form, with slender, upright branches and branchlets: lvs. narrower and smaller than in the type. Var. **ericoides**, Carr. (var. *microphýlla*, Hort.). Dwarf form, with slender branches and small and very narrow, pointed lvs. Var. **fastigiàta**, Loud. (*T. Hibérnica*, Hort.). Strictly fastigiate form, with stout crowded upright branches and branchlets: lvs. spirally arranged around the branches, dark glossy green. Gn. 35, p. 36; 40, p. 62. R.H. 1886:105. One of the most desirable evergreens of columnar habit for formal gardens. Var. **fastigiàta variegàta**, Carr. Less vigorous and more tender: lvs. marked yellowish white. Var. **fastigiàta àurea**, Standish. Young growth golden yellow. Var. **Fisheri**, Hort. Some of the lvs. deep yellow, others green. Var. **frúctu lùteo**. With yellow fr. Gn. 35, p. 37. R.H. 1886, p. 104. Var. **glaùca**, Carr. Vigorous form, with longer and narrower lvs. dark green above and with a glaucous bluish tint beneath. Var. **Jácksoni**, Gord. (var. *péndula*, Hort.). Branches spreading, pendulous at the tips, with more or less incurved lvs. Var. **procúmbens**, Loud. Prostrate shrub, with elongated and much ramified branches. Var. **Wáshingtoni**, Beissn. Vigorous form, with longer lvs., partly colored golden yellow.

2470. Old English Yews that have reached maturity — Taxus baccata.
"Addison's Walk," at Glasnevin, Ireland.

cuspidàta, Sieb. & Zucc. (*T. baccàta*, var. *cuspidàta*, Carr.). Tree, attaining 50 ft., with a trunk usually 2 ft.

in diameter: bark bright red: branches ascending: lvs. usually falcate, thickish, distinctly and abruptly mucronate, dark green above, pale fulvous green or pale green beneath, ½–1 in. long: fr. like that of *T. baccata*, Japan. Very similar to *T. baccata*, but branches more upright, stouter and lvs. somewhat broader, more abruptly mucronate and thicker in texture. Var. **nàna**, Hort. (*T. brevifòlia*, Hort., not Nutt.), is a dwarf compact form with shorter leaves.

Canadénsis, Marsh. (*T. baccàta*, var. *minor*, Michx. *T. baccàta*, var. *Canadénsis*, Gray. *T. minor*, Britt.). Fig. 2471. Prostrate shrub, with wide-spreading slender branches, rarely more than 3 ft. high: lvs. shorter and narrower, less crowded and of a lighter, more yellowish green than those of *T. baccata*, assuming in winter usually a reddish tint: fr. ripens about 2 months earlier than that of *T. baccata:* fls. monœcious (at least usually). Newfoundland to Manitoba, south to Va. and Iowa. B.B. 1:61. V. 14:252.—In cultivation it becomes usually a more upright and less straggling shrub.

T. brevifòlia, Nutt. Tree, 40–50 or occasionally 80 ft. high, with slender horizontal or somewhat pendulous branches forming a broad, open, pyramidal head: lvs. sharply pointed, dark yellowish green, ½–¾ in. long. Brit. Col. to Calif. S.S. 10:514. Probably as hardy as T. baccata.—*T. Floridàna*, Chapm. Bushy tree, 25 ft. high or sometimes shrubby: lvs. slender, ¾–1 in. long, dark green. Fla. S.S. 10:515.

Alfred Rehder.

2471. Spray of Taxus Canadensis (× ½).

TEA. The Tea plant is described in this work under *Camellia Thea*, together with its varieties *Bohea* and *viridis*, of which the former was supposed to yield black Tea and the latter green Tea. Both kinds can be produced from either variety, the difference lying in the process of manufacture. Tea is an agricultural rather than a horticultural crop. It is fully treated in general cyclopedias and elsewhere. For these reasons no general article on Tea is here included. The following article gives an idea of the present condition of the tea-growing industry in America. The Tea plant is shown in Fig. 2472.

L. H. B.

American Tea.—Previous to the inauguration of the Pinehurst experimentation in South Carolina, it had been abundantly demonstrated that parts of the southern states were well adapted for the growth of those varieties of the Tea plant which do not require a tropical climate; and before the Civil War many families supplied themselves with Tea grown and made at home, the result of the distribution of oriental Tea seed throughout the southern states by the national government. But it remained to be solved whether Tea might be produced on a large scale at a profit. The Pinehurst experiments have shown that American tea-gardens are capable of yielding as much as the average Asiatic, and that the quality of the leaf is not less satisfactory.

The advantages in favor of raising Tea in this country are the avoidance of long transportation, which generally induces deterioration in quality; security from the interference of war with the importation of foreign Teas; and the protection of the industry by a duty which shall offset the difference in the price of labor. That some sorts of Tea do not keep well, that the high "firing" of Tea to prevent mildew, necessarily deprives it of much of its flavor, and that for these reasons the best of the oriental Teas are rarely exported, least of all to the United States, are facts sufficiently well known as to require no elaboration in the present article. The present condition of China and the fear that a devastating war may at any moment invade the tea-producing provinces, seriously threaten the Tea supply from that country. Again, friction among the world-powers may at some future time entangle the United States in war with a strong naval power, in which case it is easy to foresee that commerce with the antipodes might be arrested and our supply of oriental Tea cut off. Or the outbreak of some such vegetable disease as that which not many years ago destroyed the coffee industry in Ceylon might readily sweep over the tea-gardens of Eastern Asia; and if wholly dependent upon them, the world might be deprived of its cup of Tea. It becomes, therefore, a question of national importance to provide against these contingencies.

To these advantages should be added the diversification of our industries, supplying easy and healthful occupation to thousands of needy people, especially women and children, who are well adapted for the generally light labor involved in the growth and manufacture of Tea; and converting countless acres of now idle land into blooming and remunerative tea-gardens. Where in Assam was once a dismal jungle, the home of the tiger and cobra, and full of deadlier fevers, almost uninhabited by man and practically worthless, is now—thanks to the tea-industry—a fertile, comparatively healthy, civilized region, affording lucrative employment to thousands of Europeans and natives. As much can be brought about in many neglected parts of the southern states; but probably, as was the case in Assam, only through the long category of persistent labor, severe trials, frequent mistakes, temporary depressions and final success.

The disadvantages which operate against the establishment of an American Tea industry are, chiefly, an insufficient rainfall, the higher price of labor, and the conversion of tea-drinkers to the taste of a new sort of Tea. Of secondary importance is the disinclination of capital to embark in the undertaking which, although apparently new, has, undeservedly as we think, the stigma of previous failures. Further experiments to relieve the burden of the above objections will, it is believed, pave the way for a hearty endorsement of the practicability of the industry, and then there will be no withholding of the requisite means.

The Pinehurst experiments have shown, other things being equal, the dependence of the productiveness of the tea-plant upon an abundant supply of moisture, whether of precipitation or percolation, or by artificial irrigation. The yearly rainfall in the oriental Tea countries varies from 60 to 150 inches, and even more. Almost all of it occurs in the leaf-producing months; whereas here the aqueous precipitation, during the same season amounts to about thirty inches. It becomes necessary, therefore, that the American tea-planter should conserve and supplement this supply to the utmost, by a system of tillage which shall absorb and yield to the plant as much as possible; by the distribution of the trenches and the terracing of the land with a view to preventing the denudation of the surface and the loss of water during the heavier rains. These objects are largely attained by placing the tea-gardens on well-drained, flat lowlands or former pond-beds. Very recently special attention has been paid to the artificial irrigation of tea fields, whereby it is designed to better approximate to the oriental supply of water during the cropping season, although, of course, it will be needless to attempt to imitate the tropical deluges which not only run off from, but with the soil.

The selection of the most suitable location for the establishment of a tea estate, becomes, then, of the greatest importance. The choice of fertile, flat lands, underlaid by a porous subsoil, susceptible of irrigation by gravity, as a safe-guard against droughts, will obviate the necessity of applying artificial enrichment, of underdrainage, and of elevating by applied power the water needed for irrigation. By a careful observance of these details and the selection of the right sort of seed, the American tea-garden may be made to yield as much or more than the parent bushes from which it sprung. And as the successful commercial tea estate must be on a large scale, like similar undertakings in sugar, whether beet or cane, it will be necessary to consider the means of transportation and accessibility to markets, abundant supply of labor and healthfulness of situation.

The part played by purely manual labor in the cultivation and manufacture of black Tea upon the best equipped British tea estates in India, is being steadily encroached upon by mechanical appliances until now it has been almost relegated to its last functions of plant-pruning and leaf-plucking, where it is probably secure. It is true that the cultivation of the soil on the above-mentioned gardens largely depends on manual labor with the hoe, spade and fork. This is the natural sequence of the heavy rains which otherwise denude them of a uniformly well-pulverized surface soil. By avoiding hillsides and by planting sufficiently far apart it is possible to use plows and cultivators, and thus reduce the cost of cultivation. As yet no mechanical contrivance has been found for dispensing with human labor in the pruning of the tea bushes and the gathering of the leaf. But a ten cent duty on foreign Tea should in many sections of the southern states somewhat compensate for the difference in the cost of these operations here and in the Orient. The testimony before the U. S. Labor Commission has shown that where the negro population is congested, their wages, beyond a scanty supply of food and clothing, are strictly nominal.

2472. Tea plant (× ⅓).

On well-arranged tea estates producing black Tea, the human hand hardly touches the plucked leaf from the moment when it is caught up by a trolley line for transportation to the factory, until the dry Tea is subjected to the final elimination of whatever foreign matter (stems, chips, etc.) may have got mixed with it. Until very recently the manufacture of green Tea has required a large amount of handwork for the roasting and rolling of the leaf. But most recently it has been demonstrated at Pinehurst that green tea of a high quality may be made solely by machinery, by means of the "Rotary Witherer," invented by the writer, in conjunction with the previously employed rolling and drying machines. And thus, by the substitution of mechanical operations, not only should the production of Tea on a scale commensurate with the cost of such an establishment, be made cheaper, but the product should be more uniform and free from the possible contamination of frequently unclean hands (and feet!).

It was to be expected that the different climatic conditions should exert their effect on the foreign tea plants and somewhat alter the taste of their product. This experience has been the rule with Tea, and it has cost a considerable, oftentimes disheartening, effort to successfully launch upon the market the output of each new locality. The very limited production at Pinehurst has probably prevented any obstacle to the sale of its crops; the novelty of its product may have largely assisted in readily disposing of it. But were the production of American Tea to suddenly rise into the millions of pounds, it would most certainly have to fight against the prejudice of taste and the established trade in Asiatic Teas. The natural remedy lies in the greatest possible adaptation to already formed habits of taste and a lowering of price. Time, study, perseverance and money are necessarily demanded, but success seems to be reasonably assured.

It should not surprise any one familiar with the Teas consumed in the United States and Great Britain that the sorts most highly valued in the Orient, the product of one thousand or more years of discrimination and so highly prized as often to be commercially unattainable, rarely commend themselves to the tea-drinkers in the former countries.

For nearly ten years the experimentation at Pinehurst was mainly carried on without outside assistance. The National Department of Agriculture, however, contributed very welcome assistance by the gift of tea-seed, publication of reports and other important ways; and for the past two seasons has rendered most effectual pecuniary aid, under the direction of the Secretary of Agriculture, the Hon. James Wilson, who has enlisted the interest and support of Congress in the work. The proprietor of Pinehurst appreciates most deeply this assistance, both in money and sympathy, which he recognizes as being indispensable for the ultimate inauguration of the hoped-for industry. Under the instructions of the United States Department of Agriculture he will diligently continue the experiments which seem most calculated to produce at low cost the medium grades of both black and green Teas, not losing sight, however, of the possible growth and manufacture of the finer varieties.

The first tea plant in this country was set out by the French botanist, Michaux, about 1800, at Middleton Barony, on the Ashley river, distant some 15 miles from Charleston and 10 from Pinehurst plantation. As seen a few years since, it had grown into a small tree about 15 feet high. The reports of the U. S. Patent Office and the Department of Agriculture record the results of many subsequent attempts to introduce and cultivate the tea plant in the southern states. In 1848, Mr. Junius Smith, of Greenville, S. C., being convinced from the letters of his daughter, then in British India, of the feasibility of raising Tea in this region, began his well-known experiments in this direction. In spite of many trying difficulties, they were diligently prosecuted to the time of his death, which occurred a few years later. It required only slight encouragement from the Government, by the distribution of plants and seeds, to call into active participation the ardor of many experimenters living in a climate particularly favorable for the outdoor cultivation of the *Camellia Japonica*, *Azalea Indica*, and many other subtropical plants. The Scotch botanist, Mr. Robert Fortune, was employed by the Government to gather Chinese tea seed, which was distributed in 1858 and 1859 throughout the southern states. The outbreak of the Civil War, shortly thereafter, seriously interfered with the prosecution of these experiments. Nevertheless, the resultant patches and larger gardens unquestionably produced Tea of fine flavor, although very generally devoid of that strength of liquor which latterly, and especially since the introduction of the Indo-Ceylon Teas, appears to constitute a most desirable quality for many consumers. It may be presumed, however, that this failure in pungency was largely due to defective curing and particularly to inadequate rolling of the leaf, in consequence of which the cup qualities of the Tea were not fully developed.

So far as is known, it remained for the National Department of Agriculture to begin, twenty years ago, the first serious attempt to produce American commercial Tea. Unhappily, the retirement from office of Commissioner Wm. G. Le Duc, to whose great interest in this subject the inception of the experiment was due; the serious prostration by illness of Mr. John Jackson, who had cultivated Tea in India, and under whose management the seed was obtained and the gardens established; the great distance of the station from its source of control (Washington), as also the unfavorable opinion of a subsequent commissioner as to the ultimate success of the undertaking, combined to cause the total abandonment by the Government of the tea-gardens which it had established on the same "Newington" plantation that embraced the adjoining site of the later formed Pinehurst estate.

The Pinehurst investigation owed its origin to the belief that the previous attempts to demonstrate the feasibility of American Tea culture had been arrested before reaching definite conclusions. More careful cultivation and manipulation, the result of protracted observation, with the consequent production of a higher class of Teas, might reverse the generally entertained opinion that the cultivation of Tea, as an industry, in this country must always prove a failure. It was hoped that success in this field of agricultural enterprise would furnish employment for thousands who are now idle and give a value to vast acres at present worthless.

The local experiments, begun about ten years ago, were wisely on a small scale; but they have been gradually increased until they now embrace about sixty acres planted in Tea, a commodious factory equipped with the requisite mechanical appliances, facilities for the application of irrigation to some of the tea-gardens, and a well-trained corps of youthful tea pickers. When the gardens shall have arrived at full bearing, the annual crop should exceed 12,000 pounds of dry, high grade Tea, and this quantity should suffice for the object in view; viz., to determine whether commercial tea may be profitably grown under the local conditions of soil, climate and labor. It was obviously desirable to conduct experiments with as many varieties of seed and on as different sorts of soil and location as possible. To this end, partly by the kind assistance of the U. S. Department of Agriculture and partly by purchase from domestic and foreign producers, a considerable variety of seed, representing many of the choicest sorts of Tea, was obtained. Gardens were established on flat and on rolling land, in drained swamps and ponds, and on sandy, clayey, loamy and rich bottom soil.

It was from the outset expected that many of those attempts would prove either partially or wholly unsuccessful, but with very few exceptions the gardens are fully answering the expectations. The annual crop has gradually, but steadily, grown from less than one hundred pounds to 5,000 pounds of dry Tea. Several years of experimentation have developed a system of pruning in keeping with the local climate. The hopefully crucial trial occurred on February 14, 1899, when the thermometer fell to zero, Fahrenheit—the lowest recorded temperature in 150 years of observation, but with comparatively few exceptions the tea-gardens escaped serious injury, although followed by a diminished yield for two years in some instances. A Rose (Assam Hybrid) tea garden at Pinehurst is shown in Fig. 2473.

Charles U. Shepard.

TEA, OSWEGO. *Monarda didyma.*

TEA, PARAGUAY. *Ilex Paraguariensis.*

TEASEL. The species of Dipsacus. See p. 491 and Fig. 719.

2473. Assam-Hybrid Tea garden at Pinehurst, South Carolina.

TÉCOMA (abridged from the Mexican name Tecomaxochitl.). Including *Cámpsis*, *Campsídium*, *Couràlea*, *Pandòrea*, *Stenolòbium* and *Tecomària*. *Bignoniàceæ*. Trumpet Vine. Ornamental evergreen or deciduous, climbing or upright shrubs, or sometimes trees, with opposite, odd-pinnate or digitate leaves and showy white, yellow, scarlet or violet flowers in panicles or racemes, followed by mostly elongated cylindrical pods. Most of the species are suited only for greenhouse cultivation in the North, or for outdoor cultivation only in subtropical or tropical regions. The hardiest species is *T. radicans*, which may be grown as far north as Massachusetts, at least in sheltered positions. The closely allied *T. grandiflora* is somewhat more tender. The latter, as well as *T. radicans*, var. *speciosa*, can be grown as bushy specimens and will bloom freely on the young shoots, even if cut back almost to the ground by frost. Such plants can be easily protected during the winter by laying them down and covering them with earth.

The following are well suited for cultivation in the southern states and California or in the North in the cool greenhouse and will stand a little frost: *T. australis*, *Capensis*, *jasminoides*, *mollis*, *Ricasoliana*, *Smithii* and *stans*. *T. Amboinensis*, *filicifolia* and *leucoxylon* can be grown only in tropical regions or in the warm greenhouse. The Tecomas, with the exception of the first 5 species described below, are very ornamental climbing plants. *T. radicans* is particularly adapted for covering walls and rocks, as it climbs with rootlets and clings firmly to its support. The Tecomas require rich, rather moist soil and sunny position. Propagated by seeds, by greenwood cuttings under glass, or by hardwood and also by root-cuttings and layers. See, also, *Bignonia* for culture.

The genus contains more than 100 species, chiefly natives of tropical and subtropical America, also found in Polynesia, S. Asia and Africa. Climbing or upright shrubs, sometimes trees: lvs. odd-pinnate or digitate, opposite, estipulate: fls. in racemes or panicles; calyx campanulate, 5-toothed or irregularly 2–5-lobed; corolla funnelform, with 5- or rarely 4-lobed limb; stamens 4, 2 longer and 2 shorter; style slender: ovary 2-loculed, surrounded at the base by a disk: fr. an elongated capsule, loculicidally dehiscent, with 2 valves separating from the septum, to which the seeds are attached: seeds numerous, compressed, with 2 large, thin wings. The genus is divided into several natural subgenera, which are considered by some botanists as distinct genera.

Alfred Rehder.

2474. Tecoma Smithii (× ¼).

Trumpet Vines in the South.—All the Tecomas, the climbing species as well as those growing in bush form, are very successfully cultivated in Florida, being well adapted to the soil and climate, but most of them, to do their best, need to be planted from the start in rich soil, and in addition they should be well fertilized at least once a year. They prefer a fertilizer rich in nitrogen, and a heavy mulch will also prove very beneficial. The bushy kinds can be grown in groups or as single specimens on the lawn, while the rampant climbing species, such as *T. radicans* and *T. grandiflora*, should be grown on posts and tall stumps, or they may be trained over small oaks, persimmon trees or catalpas. *T. Capensis*, a half-climbing species, is effectively used for decoration of the veranda, its glowing scarlet flowers contrasting well with the exquisite blossoms and the tropical foliage of the allamandas, thunbergias and *Clerodendron Thompsonæ*, which all flower at the same time. *Tecoma stans* and *T. grandiflora* are the two showiest species of the genus, the latter being a climber, flowering abundantly in May and June, while the first one is a large-growing bushy species opening its immense corymbs of vivid yellow flowers the latter part of November and early in December.

The Yellow Elder, *T. stans*, grows exceedingly well on high pine-land and is perfectly at home in Florida, attaining an immense size if well fertilized and mulched, dense masses 18–25 ft. high and as much through being not at all rare. This Tecoma is the glory of the south Florida gardens in autumn, as is the beautiful *Bauhinia purpurea* in April, never failing to call forth enthusiastic admiration from all beholders. No shrub is better adapted for the new settlers in the sandy pine-land gardens. When covered with its large, fragrant flowers it is visited by numberless hummingbirds and insects. Owing to its rapid growth and dense foliage from the ground, the Yellow Elder is highly valued as screen for unsightly fences and buildings. This Tecoma ripens its seed so abundantly that hundreds of seedlings come up around the old plant. The value of this shrub, blooming so late in autumn, cannot be overestimated.

T. mollis, incorrectly known to the trade as *T. stans*, var. *velutina*, also does well, but being a native of Guatemala it is much less hardy than the former. The growth is more upright and stiff, the lfts. are much larger, less serrate and much darker green and the flowers, which are borne in terminal panicles, are smaller and without fragrance and the color is a much lighter yellow. It also flowers several weeks earlier than *T. stans*. The foliage looks crimped and often blackish, being attacked by a kind of aphis and by several fungi.

T. Smithii is said to be a hybrid between *T. mollis* and *T. Capensis*, raised near Melbourne, Australia, by Mr. Edwin Smith. The plant comes true from seed, and seedlings flower when about a year old, beginning to open their large clusters of yellow and reddish trumpets in April and continuing with short intervals until cut down by frost in December.

The Cape Honeysuckle, *T. Capensis*, is another species which grows most luxuriantly in Florida gardens and in those all along the Gulf coast. It is usually grown on trellises on verandas and piazzas with a southern exposure. Of all the species this is the best and most suitable for verandas, being a dense and compact grower, evergreen, almost constantly in flower, easily kept in health and readily trained into shapely specimens. If the long shoots are cut back severely, the plant can be easily trained into shrub form. These long shoots, usually lying flat on the ground, readily strike root and form an excellent material for propagation. *T. Capensis* and *T. Smithii* are the only Tecomas which grow and flower fairly well as pot-plants in northern greenhouses. They need good soil and rather large pots to do well. If not well cared for they lose most of their foliage and look poor and unshapely.

The Chinese Trumpet Creeper, *T. grandiflora*, is the most floriferous and gorgeous of all the climbing species. In the writer's garden a large pine stump, about sixteen feet high, in May and June is completely covered with masses of brilliant fiery orange-scarlet flowers which can be seen at a distance of half a mile. The flowers are much larger, more brilliant and much more abundantly produced than those of our native *T. radicans*. While all the other Tecomas are almost free from the attacks of insects, this one is infested by a voracious caterpillar, which devours the leaves greedily. The lubber grasshoppers also attack the lower foliage. *T. grandiflora* grows well in the poor sandy soil, perfecting luxuriant shoots 25–30 ft. long in one season if well fertilized. Like our native species, this one is deciduous.

Our native Trumpet Creeper, *T. radicans*, is very common in the southern woodlands and fields. There is a great variety in the brilliancy of the blossoms. This is an excellent plant for covering the bare trunks of palmettos.

The Wonga-Wonga Vine, *T. australis*, is rather difficult to grow on high pine-land, as it needs a soil rich in humus. In rich soil, however, and liberally fertilized it is a rampant grower with beautiful dark green glossy foliage. The flowers are interesting but comparatively small, and not showy. However, the species is worth cultivating for foliage alone. It must be well taken care of and well watered during the dry spring months or it will dwindle away in a very short time.

The Bower Plant of Australia, *T. jasminoides*, is a tall, rampant climber, reveling in the Florida sunshine, but it needs a very rich soil and during dry weather an abundance of water. A heavy mulching also proves very beneficial. Plants only two feet high have flowered profusely. In good soil it grows in one season 20–30 ft. high, clambering from tree to tree.

T. Mackenii, from Natal and Caffraria, demands a very rich soil and a heavy mulch of stable manure. Its leaves easily drop from the woody branches after a cold night, and 6 or 7 degrees of frost kill the plant down to the ground. For this reason the vine should be banked with dry sand every fall and if killed down to the banking it must be cut off immediately or the entire plant will be lost. Plants raised from seed received under the name of *T. Ricasoliana*, from Italy, are much hardier and more floriferous than those obtained from seed imported from South Africa, but the flowers of both are exactly alike. In order to flower profusely this species must be planted in the full sun. It usually requires a few years before it starts into a vigorous growth, and it rarely flowers before its fifth year or before it has attained considerable size. In Florida, *T. Mackenii* should be planted on tall stumps, or on arbors and sheds by itself, never mingled with other species. This species is properly *T. Ricasoliana*.

T. filicifolia, from the Fiji Islands, has never flowered in the writer's garden and is cut down by frost almost every winter, but it is a strong grower and worth planting for the foliage alone.

T. Valdiviana has proved to be a very poor grower and is very difficult to keep in health for any length of time. Apparently not in the trade. H. NEHRLING.

INDEX.

(Including some names from other genera. S. L. = supplementary list.)

adrepens, 8.
æsculifolia, S. L.
alba, 12.
Amboinensis, 9.
atropurpurea, 7.
australis, 11.
Capensis, 6.
Chinensis, 8.
chrysantha, S. L.
filicifolia, 13.
fulva, S. L.
grandiflora, 8.
jasminoides, 12.
leucoxylon, 1.
Mackenii, 10.
mollis, 4.
Pandoræ, 11.
præcox, 7, 8.
radicans, 7.
Ricasoliana, 10.
rosea, 2.
sambucifolia, 3.
serratifolia, S. L.
Smithii, 5.
speciosa, 7.
spectabilis, S. L.
stans, 3.
Thunbergii, 8.
Valdiviana, S. L.
velutina, 4.

A. *Habit upright.*
B. *Foliage digitate: fls. pink.*
C. *Panicles few-fld* .... 1. **leucoxylon**
CC. *Panicles many-fld* .... 2. **rosea**
BB. *Foliage pinnate: fls. yellow. (Stenolobium.)*
C. *Lfts. acuminate.*
D. *Lvs. glabrous* .... 3. **stans**
DD. *Lvs. villous-pubescent beneath* .... 4. **mollis**
CC. *Lfts. oblong, obtusish* .... 5. **Smithii**
AA. *Habit climbing or prostrate, rarely suberect.*
B. *Stamens exserted. (Tecomaria.)* 6. **Capensis**
BB. *Stamens included.*
C. *Pairs of lfts. 2–5.*
D. *Fls. in racemes, orange, red or scarlet. (Campsis.)*
E. *Lfts. serrate: racemes terminal.*
F. *Corolla-tube much longer than calyx* .... 7. **radicans**
FF. *Corolla-tube little exceeding the calyx* .... 8. **grandiflora**
EE. *Lfts. entire or sinuate: racemes axillary* ...... 9. **Amboinensis**
DD. *Fls. in terminal panicles, whitish or light pink (Pandorea.)*
E. *Margin of lfts. serrate*...10. **Ricasoliana**
EE. *Margin of lfts. entire.*
F. *Corolla ¾ in. long*....11. **australis**
FF. *Corolla 1½–2 in. long*..12. **jasminoides**
CC. *Pairs of lfts. 9–12. (Campsidium.)* ....13. **filicifolium**

1. **leucóxylon**, Mart. (*Bignònia leucóxylon*, Linn.). Evergreen tree: lvs. long-petioled, digitate; lfts. usually 5, stalked, oblong-lanceolate, entire, glabrous, 1-2½ in. long: fls. terminal, in few-fld. racemes or solitary; corolla funnelform, with large, spreading limb, rosy pink, 2-2½ in. long; calyx 2-lipped: capsule linear, 6-8 in. long. W. Indies, Guiana

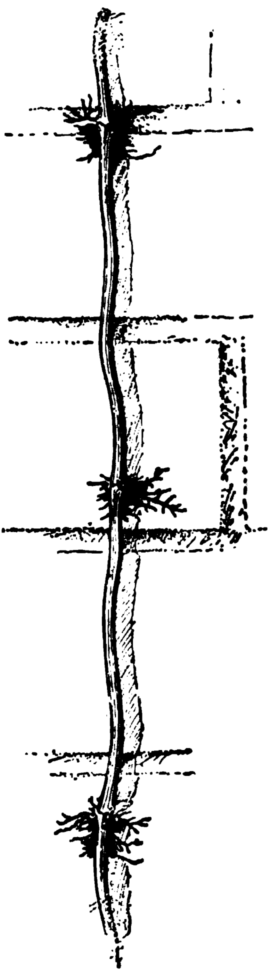
2. **ròsea**, Bertol (*Tabebuia ròsea*, DC.). Evergreen tree: lvs. digitate; lfts. 5, rarely 3, long-stalked, ovate to oblong, acuminate, entire: fls. in many-fld. terminal panicles; corolla funnelform-campanulate, with short tube and large, spreading lobes, rosy pink; calyx campanulate, obscurely 2-lobed, almost truncate. Guatemala.

3. **stáns**, Juss. (*T. sambucifòlia*, Humb. & Bonpl. *Stenolòbium stáns*, Seem.). YELLOW ELDER. Upright shrub: lvs. odd-pinnate; lfts. 5-11, almost sessile, ovate-lanceolate to narrow-lanceolate, acuminate, incisely serrate, glabrous, 1½-4 in. long: fls. in large, terminal racemes or panicles; corolla funnelform-campanulate, yellow, 1½ in. long; calyx with 5 short teeth; capsule linear, 5-7 in. long. Spring to Sept. S. Fla. to Mex., W. Indies. B.M. 3191.—Sometimes called yellow begonia. Fls. fragrant.

4. **móllis**, Humb. & Bonpl. (*T. velùtina*, Lindl. *T. stans*, var. *velutina*, Hort.). Similar to the preceding, but pubescent: lfts. 5-9, oblong-ovate, acuminate, less deeply serrate or almost entire, villous pubescent on both sides or only beneath, 2-4 in. long: fls. like those of the preceding, but little or not at all fragrant. Mexico to Chile and Peru.

5. **Smithii**, W. Wats. Fig. 2474 (adapted from The Garden). Upright shrub: lvs. odd-pinnate; lfts. 11-17, oblong, obtuse or acutish, serrate, 1-2 in. long: fls. in large, compound panicles, sometimes 8 in. long and as broad; corolla tubular-funnelform, with 5 reflexed rounded lobes, bright yellow tinged with orange, 1½-2 in. long. Sept.-Jan. Introduced from Australia and supposed to be a hybrid of *T. mollis* and *Capensis*. G. C. III. 14:649. Gn. 48:1022. I.H. 43:55, 107. Gt. 44, p. 52. G.M. 36:627.—Blooming in the greenhouse in winter and well suited for cultivation in pots.

6. **Capénsis**, Lindl. (*Tecomària Capénsis*, Seem.). CAPE HONEYSUCKLE. Climbing shrub: lvs. odd-pinnate; lfts. 7-9, ovate, acute, coarsely serrate, glabrous, about 2 in. long: fls. in peduncled terminal racemes; corolla tubular, curved, with 4-parted spreading limb, the upper lip emarginate, orange-red, about 2 in. long; calyx 5-toothed: capsule linear, 3-5 in. long. Aug.-Nov. S. Africa. B. R. 13:1117. L. B.C. 17:1672. R.H. 1895, p. 108.


2475. The Trumpet Creeper climbs by means of aërial roots.—Tecoma radicans.

7. **radicans**, Juss. (*Bignònia radìcans*, Linn. *Cámpsis radìcans*, Bur.). TRUMPET CREEPER. TRUMPET VINE. TRUMPET HONEYSUCKLE. Figs. 2475, 2476. High-climbing shrub, clinging with rootlets: lvs. odd-pinnate; lfts. 9-11, oval to ovate-oblong, acuminate, serrate, dark green above, pale and pubescent beneath, at least along the midrib, 1½-2½ in. long: fls. in terminal racemes; corolla tubular-funnelform, with 5 broad spreading lobes, usually orange with scarlet limb, 2-3 in. long, tube almost thrice as long as the 5-toothed calyx· fr. cylindric-oblong, keeled along the sutures, stalked

and with a beak at the apex, 3–5 in. long. July–Sept. Pa. and Ill. to Fla. and Texas. B.M. 485. Gn. 22, p. 339. F. 1873, p. 220. A.F. 12:34. Mn. 2:9.—Var. **atropurpùrea,** Hort. (var. *grandiflora atropurpurea*, Hort.). With large, deep scarlet fls. Var. **speciòsa,** Hort. Scarcely climbing, usually forming a bush with long and slender branches: lfts. small, oval, abruptly narrowed into a slender point often ¾ in. long: fls. orange-red, with rather straight tube; limb about 1¼ in. across. Var. **præcox,** Hort. With large scarlet fls.

8. **grandiflòra,** Del. (*T. Chinénsis*, C. Koch. *Bignònia Chinénsis*, Lam. *Cámpsis adrèpens*, Lour.). Chinese Trumpet Creeper. Fig. 2477 (adapted from Gardening). Climbing shrub, with few or no aerial rootlets: lvs. odd-pinnate; lfts. usually 7–9, ovate to ovate-lanceolate, serrate, glabrous beneath, 1½–2½ in. long: fls. in terminal racemes; corolla funnelform-campanulate, shorter and broader than that of the preceding species, scarlet, about 2 in. across; calyx 5-lobed to the middle, about as long as the tube of the corolla: fr. obtuse at the apex. Aug., Sept. China, Japan. B.M. 1398; 3011. F.S. 11:1124, 1125. Gn. 27, p. 94; 33, p. 348; 47, p. 373. G.F. 3:393. F.R. 2:27. Gng. 4:195.—Less high-growing and sometimes shrubby; flowers when quite small and can be grown as a pot-plant, also suited for forcing. Var. **atrosanguínea,** Hort. With deeper scarlet fls. Var. **Thúnbergi.** Hort. (*T. Thúnbergi*, Sieb.). Fls. bright scarlet, with very short tube and reflexed lobes. Often a var. of *T. radicans* is cult. under the name *T. Thunbergi*. There are probably also hybrids of this and the preceding species. Var. **præcox** is advertised.

9. **Amboinénsis,** Blume. Evergreen climbing shrub: lvs. odd-pinnate; lfts. 3–7, stalked, elliptic-ovate, acuminate, sinuate or almost entire, puberulous beneath, 3–3½ in. long: fls. in lateral racemes, corolla tubular-funnelform, with erect or slightly spreading 5-lobed limb, red, 3–4 in. long. Amboina.

10. **Ricasoliàna,** Tanfani (*T. Mackénii*, W. Watson. *Pandòrea Ricasoliàna*, Baill.). Evergreen climbing shrub: lvs. odd-pinnate; lfts. 7–11, short-stalked, elliptic-ovate, acute or acuminate, serrate, dark green above, pale beneath, glabrous, about 1 in. long: fls. in loose, terminal panicles; corolla funnelform, campanulate, with spreading 5-lobed limb, light pink, striped red, 2 in. long; calyx 5-toothed: fr. linear, terete, 10–12 in. long. S. Africa.

11. **austràlis,** R. Br. (*Bignònia Pandòræ*, Sims). Wonga-wonga Vine. Evergreen high-climbing shrub: lvs. odd-pinnate; lfts. 3–9, elliptic-ovate to ovate-lanceolate, acuminate but bluntly pointed, entire or sometimes coarsely crenate, shining above, glabrous, 1–2½ in. long: panicles many-fld.; corolla funnelform-campanulate, with 5-lobed spreading limb, yellowish white, spotted violet in the throat, ¾ in. long: fr. oblong, pointed, 2–3 in. long. Spring. Australia. B.M. 865. Gn. 27, p. 94.

12. **jasminoìdes,** Lindl, (*Bignònia jasminoìdes*. Hort.). Bower Plant of Australia. Evergreen climbing shrub: lvs. odd-pinnate; lfts. 5–9, almost sessile, ovate to lanceolate, acuminate but bluntly pointed, entire, glabrous, 1–2 in. long: panicles rather few-fld.; corolla funnelform-campanulate, with large spreading 5-lobed limb with crenate lobes, white, rosy pink in the throat, 1½–2 in. long; calyx small, 5-lobed. Aug.–Oct. B.R. 23:2002. B.M. 4004. R.H. 1895, p. 109. Var. **álba** is a trade name.

2477. Tecoma grandiflora on a clothes post.

13. **filicifòlia,** Nichols. (*Campsìdium filicifòlium*, Van Geert). Climbing evergreen shrub: lvs. odd-pinnate, 5 in. long; lfts. 19–25, ovate, with 2 or 3 lobes on each side, the larger lobes sometimes dentate. Fiji Islands. F. 1874:280.

T. æsculifòlia, DC. (Tabebuia æsculifolia, Hemsl. Bignonia æsculifolia, Humb. & Bonpl.). Evergreen tree, about 20 ft. high: lvs. digitate, with 7 oblong-obovate lfts., pubescent above, tomentose beneath: fls. in terminal panicles, subcampanulate, orange-red, with yellow spots on the 3 lower lobes. Mexico.—*T. chrysántha*, DC. (Tabebuia chrysantha, Nichols.). Evergreen tree: lvs. digitate, with 5 ovate entire, tomentose lfts.: fls. in terminal racemes, yellow, funnelform, 2 in. long. Caracas. —*T. fúlva*, Don (Tecomaria fulva, Baill.). Evergreen upright shrub to 15 ft. high: lvs. odd-pinnate, with 9–13 small, ovate, toothed lfts.: fls. in terminal panicles, tubular-funnelform, slender, yellow, tinged red, 1½ in. long; stamens slightly exserted. Peru. B.M. 4896. F.S. 11:1116.—*T. serratifòlia*, Don (Tabebuia serratifolia, Nichols.). Evergreen tree: lvs. digitate, with 4–5, oblong-ovate acuminate lfts. serrate at the apex, 3–5 in. long: fls. in terminal panicles, tubular-funnelform, yellow. W. Indies. —*T. spectábilis*, Planch. & Lind. (Tabebuia spectabilis, Nichols.). Evergreen tree: lvs. digitate, with 5-stalked, ovate to oblong-ovate, crenately serrate lfts.: fls. in terminal panicles, orange-yellow, funnelform-campanulate. Columbia. F.S. 9:948.—*T. Valdiviàna*, Phil. (Campsidium Chilense, Reiss. & Seem.). Evergreen climbing shrub: lvs. odd-pinnate, with 9–15 elliptic to ovate-oblong, small lfts., serrate near the apex or almost entire: fls. in terminal racemes, tubular, with short 5-lobed limb, orange, about 1 in. long. Chile. G.C. 1870:1182. B.M. 6111.

2476. Trumpet Vine—Tecoma radicans (× ¼).

Alfred Rehder.

TECOPHILÆA (named for Tecophila Billotti, daughter of a botanist). *Hæmodoràceæ*. Chilean Crocus. Two Chilean bulbous early-flowering plants, useful for pots or for forcing, one of which is offered by Dutch bulb dealers. They look like blue crocuses. They are stemless plants, with 1–few-fld. scapes and linear or lanceolate leaves arising from tunicated corms. The flowers are blue, campanulate, with 6 segments, 3 perfect stamens and 3 staminodia, a single style and a 3-loculed ovary. The botanical position of Tecophilæa is open to discussion, but the inferior ovary seems to take it out of the Liliaceæ, with which it has been placed by some writers. The plants are useful for blooming in pots indoors early in spring. *T. violæflora*, Bertero, does not appear to be introduced. The one in cultivation is—

cyanocròcus, Leyb. (sometimes written *T. cyanocrocea*). Scapes 1–3, erect, 3–6 in. high, 1-fld.: lvs. 2–3, linear-canaliculate and undulate: fl. azure-blue with white throat, about 1½ in. long, with a narrow tube and obovate segments. Var. **Leichtlini,** Hort., has fls. deep blue with no trace of yellow; said by some to have a white center. Var. **Règelii,** Baker (not known to be in the trade), has longer peduncles, longer and narrower scarcely undulate lvs., and narrow oblong segments. Species hardy at New York city in protected places, but usually the plants do not thrive more than a year or two; they ought to do better farther south. Blooms very early in spring. Fls. violet-scented.

L. H. B.

TEÈDIA (J. G. Teede, German botanist, who lived some time in Portugal and died at Surinam). *Scrophulàriaceæ.* Two species of South African plants, with pink 5-lobed fls. ⅓-¾ in. across. They are tender to frost. *T. lucida* was introduced to southern California in 1900, and Franceschi records that it blooms all the year. The larger-fld. species, *T. pubescens*, seems not to be known to the American trade. Both plants emit the rank herbaceous smell peculiar to henbanes when their foliage is bruised, and *T. pubescens* has the same sort of greasy pubescence. The plants hardly seem worth cultivating in northern greenhouses. When they were new to cultivation they were supposed to be biennial herbs, but Bentham and Hooker call them shrubs. Franceschi writes: "*T. lucida* acts like an annual in southern California. It is rather pretty but weedy. It seeds freely. Seems to prefer half shade. The smell of the foliage is very objectionable."

Generic characters: calyx deeply 5-cut; corolla-tube cylindrical; lobes 5, rounded, subequal; stamens 4, didynamous, included; anther-cells parallel, distinct: ovules numerous in each locule: berries subglobose, indehiscent.

lùcida, Rud. Glabrous: stem 4-cornered; lvs. oblong-ovate, acuminate, 2 in. long, decussate; petioles winged: panicles leafy, decussate: fls. rosy pink: seeds many, small. S. Afr. B.R. 3:209. W. M.

TELANTHÈRA (name refers to the fact that all ten parts of the staminal cup are equally developed). *Amarantàceæ.* ALTERNANTHERA. Apparently all the Alternantheras used by gardeners as bedding plants belong to the genus Telanthera, which is distinguished from the true genus Alternanthera by having 5 anther-bearing stamens and 5 elongated antherless staminodia united into a cup or tube. In Alternanthera the tube is short or almost none, the anther-bearing stamens sometimes less than 5, and the staminodia short or none. Of Telantheras there are 40 to 50 species, mostly herbs, in tropical America and one in western Africa. The leaves are entire, ovate to elongated, opposite: fls. small, usually in dense heads in the axils, whitish or sometimes colored, perfect, each subtended by 2 bractlets.

The Alternantheras of gardeners are much used in carpet-bedding and for ribbon-borders, because of their low, compact growth, the bright colors of the foliage, which holds its character throughout the season, and the ease with which they withstand shearing. They are usually kept within six inches of the ground. They are tender to frost, and grow best in warm sunny places. The flowers are inconspicuous and of no account to the gardener. They comprise the stock plants for the foundation work in carpet-bedding.

The plants are propagated by cuttings or division. In either case, they must be carried over winter in the greenhouse or in hotbeds, preferably in the houses at the North. The plants should be kept at 60° or 65° during winter, and rather dry to hold them more or less dormant. Place them where they will receive only enough light to keep them healthy. (1) Cuttings are usually made in August from strong plants growing in the open. The cuttings can be struck in shallow flats and then wintered in these flats without transplanting. The cuttings should be well established before winter sets in, else they will remain weak. In March or April they may be potted off, preparatory to using them in the open. (2) Division is usually preferred by gardeners who have much bedding to do. The plants are lifted after the first frost, cut back to three or four inches long, and planted in flats. In March or April, the plants are divided and the parts (with the old roots shortened in) are potted or transplanted to other flats. However grown, the plants should have four to six weeks in a hotbed if possible, before they are placed in the open ground. Even in the warm greenhouse they usually make slow growth in March and April.

The botanical status of the garden Alternantheras is imperfectly understood, and the group needs careful study from living plants. Various garden names cannot be accounted for at present. The common garden Alternantheras appear to have issued from the three following Brazilian species.

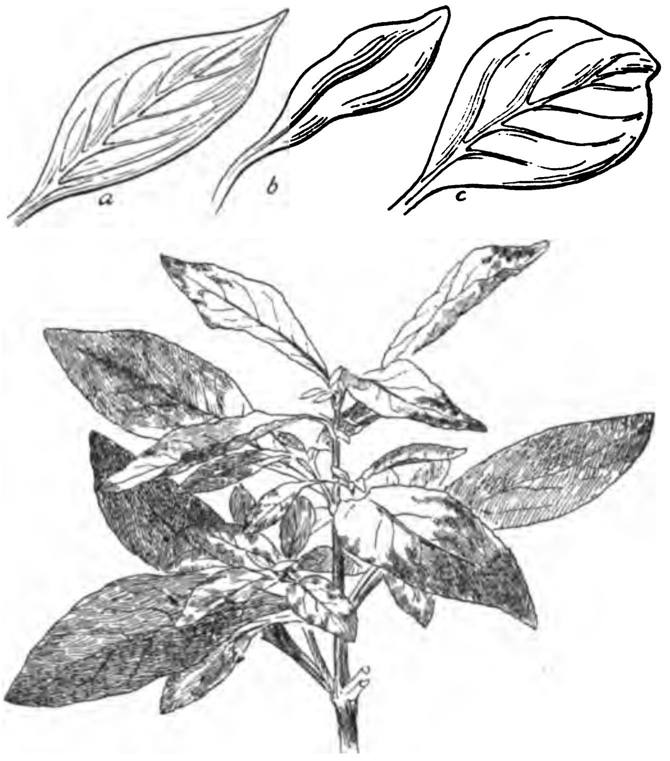
A. *Lvs. essentially lanceolate or elliptic.*

amœna, Regel. Fig. 2478. Very dwarf: lvs. long-lanceolate or oblong-lanceolate, sometimes elliptic, acuminate, very short-petioled, the under color mostly green but veined and blotched with red and orange: fl.-heads sessile, single, in pairs or 3's, and terminal. I.H. 12:447; 15:558.—To this apparently belong the garden names *amabilis, spectabilis, sessilis, rosea, Reinhardi.*

AA. *Lvs. essentially spatulate.*

Bettzichiàna, Regel (*Alternanthèra paronychioìdes,* Hort.). Fig. 2478*b*. Lvs. narrow, spatulate, gradually narrowed into a long petiole, orange-red shaded with green: fl.-heads sessile, single, in pairs or 3's, terminal and axillary. I.H. 12:445.—To this species appear to belong the garden names *picta, tricolor, aurea, aurea nana compacta, paronychioides, versicolor aurea* and *p. major Kuntzii, magnifica.*

versìcolor, Regel. Fig. 2478*c*. Usually becoming taller, much branched, and apparently less used for carpet-bedding than the others: lvs. round-spatulate, narrowed into a short petiole, the colors mostly in shades of copper-red or blood-red, with patches of green between the veins: fl.-heads sessile, single or in pairs. I.H. 12:440.—*T. ficoidea* is probably to be referred here. L. H. B.



2478. Spray of Telanthera amœna; also leaf outlines of (a) T. amœna, (b) T. Bettzichiana, (c) T. versicolor.

TELEGRAPH PLANT. *Desmodium gyrans.*

TELÈKIA is referred to *Buphthalmum.* **T. speciòsa** is *B. speciosum.*

TELFÀIREA (Charles Telfair, 1778–1833, Irish botanist; died in Mauritius.). *Cucurbitàceæ*. *Telfairea pedata* is a tall-growing climber from tropical Africa with digitate leaves, large, purple-fringed flowers of curious appearance, and huge gourds which sometimes weigh as much as 60 pounds and contain 100 to 300 edible seeds. It has been cultivated in English stoves, a single shoot attaining a length of 56 ft. in a year or so. The male and female fls. are borne on separate plants. The species is too rampant for the ordinary conservatory. It was introduced into southern California in 1900, presumably for its economic interest. The seeds are roundish, about an inch across, and the kernels are sweet to the taste, and are said to be as good as almonds. The negroes of tropical Africa boil and eat them. These seeds also yield an abundance of oil which has been said to be equal to olive oil.

The fruit becomes 1½–3 ft. long and 8 in. wide. It is oblong in shape, has 10–12 deep furrows and is always green. Both male and female fls. are 5-lobed, copiously fringed and purple in color, the females somewhat brownish, with a circular green throat, while the males have a 5-pointed star of green in the middle. The male fls. are about 2 in. across, females 4 in. across, with an ovary 2 in. long. The foliage has an unpleasant smell when bruised.

Telfairea is a genus of only 2 species, both tropical African, and very much alike. The two species are distinguished by the venation of the lvs.: *T. pedata* has pinnate venation, while *T. occidentalis* has 3 nerves originating near the base of the leaf. Generic characters: male fls. in racemes; corolla rotate; stamens 3, one of the anthers with 2 compartments, the others 4-celled: female fls. solitary: ovary 3–5-loculed; ovules in one series on the imperfect septa: seeds fibrous-coated. See Cogniaux, DC. Mon. Phaner. Vol. 3, p. 349.

pedàta, Hook. Root stout, fleshy: stem perennial, 50–100 ft. long: lvs. long-stalked: lfts. 3–5 in. long, repand-toothed: fls. and fr. described above. Zanzibar. B.M. 2681 (*Feuillæa pedata*); 2751, 2752. W. M.

TELLÌMA (anagram of Mitella). *Saxifragàceæ*. Tellima is a genus of 8 species of perennial herbs which are the western representatives of the Bishop's Cap or Mitella familiar to lovers of wild flowers in the East. They have tuberous rootstocks. Most of their lvs. are from the roots. Strong plants send up numerous stems one or two feet high, bearing racemes of small white, pink or red flowers. They are choice subjects for wild gardening, being valued for their tufted habit, pretty lvs., and for the airy grace of their inflorescence. On close inspection the fls. are seen to be beautifully fringed or cut, suggesting a bishop's miter. *Tellima grandiflora* is probably the most desirable species. It is practically the only kind known to European gardens. It has one-sided racemes about 6 in. long, containing as many as 30 fls., each a quarter of an inch across or more. It blooms in early spring and the fls. change from greenish to pink or red. It is not as showy a plant as *Heuchera sanguinea*. Tellimas are supposed to be hardy in the eastern states. They require dense shade. A few kinds have been offered by specialists in native plants and are obtainable from western collectors. The plants are called "Star Flowers" in California.

Tellima differs from Mitella mainly in the capsule, which is 2-beaked in Tellima, not beaked in Mitella. Calyx bell-shaped or top-shaped; petals inserted in the sinuses of the calyx, cleft or toothed, sometimes entire; stamens 10: ovary 1-loculed: seeds numerous.

A. *Petals pinnately cut into long, thread-like segments.*

B. *Fls. not fragrant.*

grandiflòra, R. Br. FALSE ALUM ROOT. Height 1½–2¼ ft.: lvs. rounded, cordate or angle-lobed and toothed: fls. greenish, becoming pink or red; calyx inflated-bell-shaped, nearly ½ in. long; petals laciniate-pinnatifid, sessile. Calif. to Alaska. B.R. 14:1178.

BB. *Fls. fragrant.*

odoràta, Howell. Height 1–2 ft.: lvs. broadly cordate, obscurely lobed and crenately toothed: fls. red. Wet places near Columbia river.

AA. *Petals palmately 3–7-parted.*

parviflòra, Hook. Height ¾–1 ft.: radical lvs. mostly 3–5-parted or divided, the divisions narrowly cuneate and once or twice 3-cleft into narrow lobes: fls. pink or sometimes white; petals with a slender claw, the limb palmately 3–7-parted. Brit. Col. to Utah and Colo.

W. M.

TELÒPEA (Greek; *seen at a distance*). *Proteàceæ*. *Telopea speciosissima* is one of the showiest shrubs of New South Wales. It grows 6–8 ft. high and has dense terminal globular heads of rich crimson. These heads are 3 in. across and 3 or 4 in. deep and bear a rough resemblance to a florist's chrysanthemum. The showiest parts, however, are involucral bracts. This plant is known as the Waratah. It is one of the most distinct members of its family, for a horticultural account of which see *Protea*. In the early part of the nineteenth century, when proteads and other shrubs from Australia and the Cape were in great favor, the Waratah made a vivid impression. The "Waratah" chrysanthemum and other florists' flowers of the period took their name from the distinct and fashionable color of the Waratah. Ever since that era the Waratah has been considered a rare and difficult subject and its occasional flowering has been signalized at the exhibitions. The old "stoves" in which proteads throve so wonderfully were crude affairs compared with the modern hothouse with its perfected devices for maintaining a hot and moist atmosphere. Such plants require too much room and are too long and uncertain in blooming ever to become popular subjects for northern conservatories, but they are splendid plants for exhibitions. Ernest Braunton writes that the Waratah is imported every year from Australia into California but is very hard to grow. All accounts agree that proteads should have good drainage and plenty of water while growing. When once established, Telopea can probably be propagated by layering.

Telopea is a genus of 3 species, 2 Australian, 1 Tasmanian. Perianth irregular, the tube open early on the under side, the laminæ broad and oblique; anthers sessile at the base of the laminæ; hypogynous glands united into a short, oblique, nearly complete ring: fr. a recurved, leathery follicle; seeds flat, winged. Closely related to Embothrium, being distinguished chiefly by disk and style. Flora Australiensis 5:534 (1870).

speciosissima, R. Br. (*Embòthrium speciosissimum*, Sm.). WARATAH. WARRATAU. Stout, glabrous shrub 6–8 ft. high: lvs. cuneate-oblong, 5–10 in. long, mostly toothed in the upper part, coriaceous: fls. crimson, in a dense ovoid or globular head 3 in. across: involucral bracts colored, the inner ones 2–3 in. long. N. S. Wales. B.M. 1128. G.C. II. 17:677. Gn. 22:361. I.H. 34:29. —*Hylogyne speciosa*, Salisb., is an older name for this plant. W. M.

TEMPERATURE. See *Conservatory* and *Greenhouse*.

TEMPLETÒNIA (J. Templeton, botanist of Belfast, early part of nineteenth century). *Leguminòsæ*. The CORAL BUSH of Australia, *Templetonia retusa*, is a tall shrub with showy scarlet fls. 1–1½ in. long. The flower presents a very different appearance from the papilionaceous or sweet pea type, the floral parts being all rather narrow and about the same length, with the standard strongly reflexed. This plant was formerly cult. in European greenhouses, where it generally flowered in April or May. It was usually planted in the greenhouse border rather than in pots and was thought to prefer a compost of peat and loam. It was slowly propagated by cuttings and went out of fashion along with Australian shrubs in general. It has lately been offered for outdoor cultivation in southern California, where many choice plants of its class are being cultivated. *T. retusa* is probably the most desirable species of the genus.

Generic characters: shrubs or subshrubs: lvs. when present alternate, simple, entire: fls. axillary, solitary or 2 or 3 together, red or yellow; standard orbicular or obovate, usually reflexed; wings narrow; keel as long as the standard or shorter; stamens all united in a sheath open on the under side; anthers alternately long and erect and short and versatile: pod sessile or stipitate, flattened, ovate-oblong or linear, completely dehiscent. Flora Australiensis 2:168 (1864).

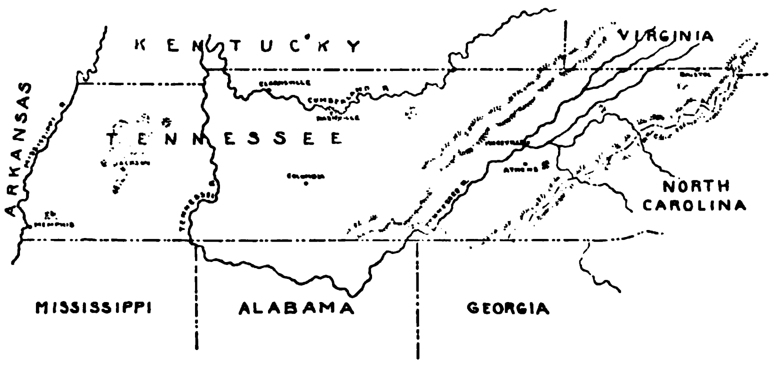
retusa, R. Br. (*T. glaùca,* Sims). CORAL BUSH. Tall, glabrous or glaucous shrub: lvs. broadly obovate to narrow-cuneate-oblong, sometimes all under ¾ in., sometimes all over 1 in. long, emarginate or mucronate, coriaceous: fls. red (or rarely white); calyx with 4 very short, broad teeth, the lowest longest: pod 1½–2 in. long. B.M. 2334; 2088. B.R. 5:383; 10:859. L.B.C. 6:326; 7:644.

W. M.

TENNESSEE, HORTICULTURE IN. Fig. 2479. The horticultural products of Tennessee are greatly diversified on account of the varied soil and climatic conditions. A knowledge of the natural divisions of the state is essential to a thorough understanding of its adaptability to the various branches of horticulture.

The Unaka region, on the eastern border, contains about 2,000 square miles. Some of the peaks are over 6,000 feet above sea-level, and the average elevation is 5,000 feet. The soil is gravelly and thin, but contains areas that are fairly productive. Apples are grown to a limited extent.

The valley of East Tennessee is the next division. It contains 9,200 square miles and an average elevation of 1,000 feet. The soils are generally well adapted to fruits. Records taken at Knoxville during a period of twenty-six years show an average annual rainfall of 50.92 inches.



2479. Map of Tennessee, suggesting main horticultural features.

Fruit trees succeed throughout the state, but eastern Tennessee (between the mountain ranges) is best adapted to large fruits and grapes. The shaded areas indicate localities in which small fruits and vegetables are grown as field crops for market.

A thousand feet above the valley of East Tennessee lies the Cumberland Tableland, containing 5,100 square miles. This section for the most part is sterile, the soils being sandy and thin. There are, however, areas of land which produce fruits and vegetables of the highest quality. The climate is particularly healthful.

West of the Cumberland Tableland are the Rimlands, or Highlands, which have an area of 9,300 square miles and an average elevation of nearly 1,000 feet. This territory possesses a great variety of soils, some of which are highly fertile and well suited to orcharding. Numerous streams cut the land into valleys, which are generally deep and narrow.

The Central Basin, in which Nashville is situated, contains 5,450 square miles, with numerous elevations of 200–300 feet above the general level. The soil is fertile and well adapted to small fruits and vegetables. The average annual rainfall at Nashville is 49.53 inches.

The next natural division is the valley of the Tennessee river. It has an elevation of about 360 feet and an area of 1,200 square miles.

The Plateau, or Slope, of West Tennessee is the most important horticultural region commercially in the state. It contains 8,850 square miles and has an average elevation of 500 feet. The soils are generally light, fertile and easily cultivated, but demand careful treatment to prevent serious damage by washing.

The last natural division, the Mississippi bottoms, has an area of 950 square miles and an average elevation of 295 feet. It is little used for horticultural purposes.

The possibilities of Tennessee for the cultivation of fruits and nuts are evidenced by the profusion of these products in a wild state. Wild strawberries are found thoroughly distributed. Blackberries thrive everywhere. In favorable localities they attain a very large size, surpassing in this respect some of the cultivated varieties. Wild blackberries are marketed in large quantities in many sections. Red and black raspberries grow in most parts of the state; and in some sections the best of the wild blackcaps when transplanted to the garden, give better results than any of the cultivated varieties. Wild grapes abound throughout the state. Plums are also found in profusion; and the Wild Goose variety is said to have originated in Tennessee. Other wild fruits are dewberries, cherries, crab apples, Juneberries, pawpaws, persimmons, and huckleberries. Of the nuts, chestnuts are most plentiful, especially in the hilly and mountainous sections. The chinkapin flourishes in East Tennessee. Black walnuts are exceedingly numerous. Pecans thrive in the low sections. Hazelnuts, and butternuts or white walnuts, are also plentiful.

Some of the native seedling fruits are highly valued. This is especially true of apples, peaches and strawberries. Many well-known varieties introduced from other states are not satisfactory. As a rule, the introduced kinds are not so well adapted to the climate and soils as those of local origin. This fact is becoming well established among practical horticulturists. It is only a few years since orchardists were planting varieties of winter apples originated in the North. After repeated failures to get first-class fruit of good keeping qualities, they have begun to use native seedling varieties. Some of them will doubtless be largely cultivated in the future. A few native varieties of winter apples have gained considerable popularity among commercial orchardists. The fruits of these sorts have commanded remunerative prices in competition with apples shipped from the North. Owing to the great diversity of soils and exposures in this state, it is very important to select varieties that are adapted to the conditions where the trees are to be planted. The fact that a desirable apple has been originated in East Tennessee is no proof that it will succeed well in all parts of this political division. On the contrary, it is likely to give good results only in certain soils and on certain exposures that are requisite for its proper growth and fruitfulness.

All of the classes of fruits commonly grown in the northern half of the United States are produced in Tennessee for home and commercial purposes. Strawberries are shipped more largely to distant markets than any other fruit. The area in peaches is increasing rapidly. Summer apples are shipped from several sections. Of the vegetables, tomatoes and Irish potatoes are the most important commercially. The following counties have been active in producing and shipping fruits and vegetables: Gibson, Carroll, Crockett, Madison, Haywood, Hardeman, Shelby, Hamilton and Rhea. Peanuts are grown largely in Perry, Humphreys, Benton, Decatur, Hickman and Wayne.

Many locations in East Tennessee are peculiarly well adapted to the culture of grapes. This is shown by the large exhibits of fine grapes made at the fall horticultural meetings. The local markets are well supplied with home-grown grapes during their season.

The following special crops are produced to some extent, and are promising for more extensive cultivation: English walnuts, paper-shell pecans, Paragon chestnuts, and Japanese persimmons grafted on the common persimmon.

R. L. WATTS.

TEN-O'CLOCK. *Ornithogalum umbellatum.*

TEN-WEEKS STOCK. *Matthiola incana,* var. *annua.*

TEOSINTE is an annual grass of immense value for forage in the South. It is very much like maize in general appearance and in the structure of the fls., but differs in not forming an ear, the slender jointed spikes being free from one another. By many botanists it is considered the original form of maize. It is known to catalogues as *Reàna luxùrians*, Dur., but is properly *Euchlæ̀na Mexicàna*, Schrad., for the botany of which see B.M. 6414, where the plant is called *Euchlæna luxurians*. The plant is pictured in Bull. 14, Div. of Agrost., U. S. Dept. of Agric., and in Farmers' Bulletin No. 102, from which a few points are here abstracted.

Teosinte probably produces a greater bulk of fodder per acre than any other grass. At the Louisiana Experiment Station it has yielded the enormous amount of 50 tons of green forage per acre; this crop was sold in the field to dairymen for $2.50 a ton. The plant grows 8–12 ft. high and tillers freely, sending up 20–50 stalks from the same root. One hundred stalks from one seed have been recorded. It may be cut several times during the season, but nearly as good results will be obtained from a single cutting made before there is any frost. The stalks are tender and there is no waste in the fodder when dry or green. One pound of seed to the acre, planted in drills 3 ft. apart and thinned to a foot apart in the drill, is recommended. Teosinte is a native of the warmer portions of Mexico and Central America. The seed rarely matures north of southern Florida.

F. LAMSON SCRIBNER.

TEPHRÒSIA (Greek, *tephros*, ash-colored, hoary; referring to the foliage). *Leguminòsæ. Tephrosia Virginiana* is a hardy perennial herb which grows 1–2 ft. high, has many narrow, ashy gray leaflets and fls. about as large as sweet peas, yellowish white, marked with purple. The plant grows in dry sandy soil over a wide range in the U. S. and blossoms in June. The racemes are terminal and may contain a dozen fls. each ½–¾ in. across. This species is offered by collectors of native plants. In spite of the large size of the fls., the species is not likely to become a garden favorite, as the colors are not pronounced and the flowers are more or less hidden amid the foliage. In some English works this plant is sometimes rated as half-hardy.

A much showier species is *T. macrantha*, a Mexican shrub 6–10 ft. high, which bears its large purple and white fls. to the number of 75 in a diffuse panicle about a foot long. It was collected by C. G. Pringle, but it is doubtful whether the plant is in cultivation. It would be a handsome addition to southern shrubberies.

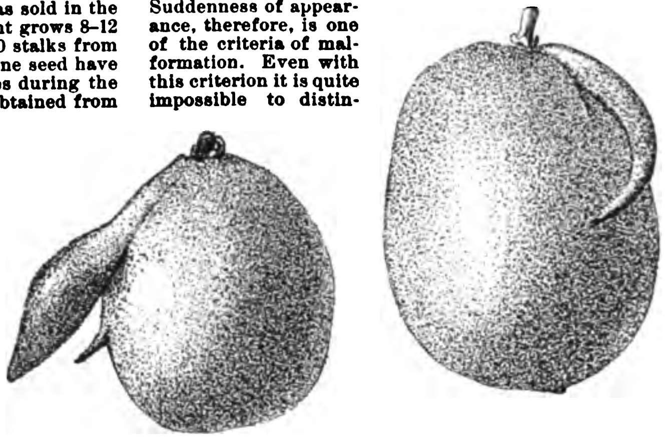
Tephrosia is a genus of uncertain limits and of small horticultural value. For fuller accounts, see Gray's Manual. B.B. 2:292. B. L. Robinson's revision of the North American species in Bot. Gaz., Sept., 1899, pp. 193–202, and Miss Vail's revision of the North American species of Cracca in Bull. Torr. Bot. Club 22:25, 26.

Virginiàna, Pers. GOAT'S RUE. CATGUT. WILD SWEET PEA. HOARY PEA. Silky-villous, erect, 1–2 ft. high: lfts. 17–29, linear-oblong. June, July. Dry sandy soil, New Eng. to Minn., south to Fla. and Mex. B.B. 2:292.—Roots long, slender and very tough.

W. M.

TERATOLOGY: that part of the biological sciences which is concerned with unusual forms of the whole body or any of its organs. These, by comparison with the normal forms, are called malformations or monstrosities. Malformations among plants are due to a disturbance of the ordinary course of the growth and development of the organs. Such a derangement of function may be looked upon as disease. The malformation may be occasioned by merely local disease, or it may be a symptom of general disease. Malformations may be brought about (*a*) by the direct influence of external physical conditions; (*b*) by the action or presence of some other organism—plant or animal; (*c*) by the operation of unknown internal causes. The experimental study of the causes of malformations is yet in its infancy, and in only a few cases can specific explanations of their origin be given. Having once occurred, malformations may be inherited and the form, at first unusual, may be fixed by selection and become characteristic of a race. Thus the cockscomb (*Celosia cristata*) shows a hereditary and fixed fasciation; and double flowers are so common as hardly to be esteemed malformations.

The distinction between malformation and variation is very indefinite. On the one hand, the various forms of root, stem, leaf and flower in cultivated plants are extraordinary as compared with the wild types from which they were derived, but having diverged from the type by relatively small increments, they are not looked upon as monstrosities. Suddenness of appearance, therefore, is one of the criteria of malformation. Even with this criterion it is quite impossible to distinguish between malformation and variation, except arbitrarily. When the difference between the ordinary and unusual forms is very marked, and particularly when the alteration gives rise to grotesque forms, having altered functions, one speaks of malformation rather than variation. Malformations have been found in all groups of plants, though they are most noticeable in the ferns and flowering plants. A very large number have been recorded; Penzig (see below) has collected data of monstrosities in more than 4,000 species, and the list has been augmented since the publication of his work. Classification of such numerous and diverse phenomena is a most difficult task and involves an extensive technical terminology. Here only a few of the more important categories can be mentioned.



2480. Extra free pistils of the orange persisting even in fruit.

I. ALTERATION IN THE NUMBER AND SIZE OF ORGANS. 1. *Pleiomery* is the term applied to the increase in the number of leaf-like organs. The number of members of a whorl may be increased; or the number of whorls; or the number of distributed organs may become greater than usual. Double flowers often show pleiomery. Fig. 2003. Extra free pistils of the orange, persisting even in the fruit, are shown in Fig. 2480. More regular polycarpy appears occasionally in the tomato, and constantly in the "two-story" apples (St. Valery). It is a fixed race character in the Washington or Navel orange, in which it is associated with seedlessness. A similar example of polycarpy is shown at Fig. 2481, in which the abnormal growth is an extension of the axis of growth with additional carpels.

2. *Abnormally profuse branching* of the stem is often produced by a fungous parasite. The branches are usually irregular and more or less fasciate, producing what is called "witch brooms." These are not uncom-

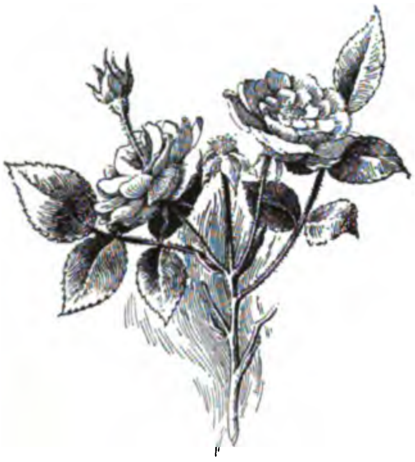
mon on conifers (especially Abies) and some deciduous trees. Similar deformations are sometimes due to insect agency, or to unknown causes. For example, a simple inflorescence may develop flower-clusters instead of single flowers, e.g., in the common plantain.

2481. Another example of polycarpy.

In this case the excrescence may be considered an extension of the axis of growth with an added whorl of carpels.

3. *Proliferation* is continued growth of the axis or the development of a branch from growing points which usually either do not form or remain dormant. For example, the growing point of the axis of the flower is usually obliterated in the formation of the pistil, but in the pear, apple and strawberry it frequently continues its growth through the flower and may even become a leafy shoot beyond the fruit. Proliferation may also occur by the continued growth of the axis through a compact flower-cluster, like the head of Compositæ; or by the development of branches in the axils of the petals and sepals, e. g., in cauliflower, or the rose shown in Fig. 2482. Some double flowers are made "extra double" by this sort of proliferation. Proliferous embryos have been found in the almond, a smaller embryo lying between the seed-leaves of the larger, and sometimes a third within the second. They are quite separate at maturity. When proliferous branches show a tendency to separate easily and to develop roots, or when they become bulb-like, so that they reproduce the plant readily when separated, the plant is said to be viviparous.

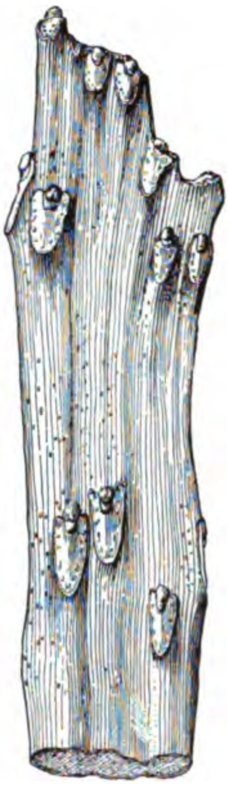
4. By various causes complete *non-development* of organs (suppression) may occur; or an organ may be arrested at any stage of its growth or be dwarfed. Correspondingly, extraordinary growth of any part (hypertrophy) is common. Arrest or suppression is often ascribed to the influence of other organs, but these alleged causes are in few cases supported by experimental evidence. Thus, it is commonly believed that the absence of seeds in the banana and pineapple is due to the excessive development of the flesh in these fruits, but this is a mere conjecture as yet. Sometimes spurs and nectaries do not develop. Figs. 2486–7.



2482. One rose growing out of another (on the left). Example of proliferation.

II. Alteration of Form, involving no considerable change in nature or function of the organs.

1. *Fasciation* in stems (Fig. 2483) produces a broadened and fluted form, often curved in crozier-like fashion. The apex is furnished with several buds (rarely only one), and the arrangement of the leaves is quite anomalous. Fasciation is especially common in rapidly growing stems when an abundant supply of both water and food is available. Asparagus, dandelion and sucker shoots arising from trees after topping or severe pruning, frequently furnish examples. Although the fasciated stem seems to have been formed by the early union of several stems, this is rarely the case; rather the growing apex develops extraordinarily in one (transverse) dimension or organizes several buds which grow in unison.



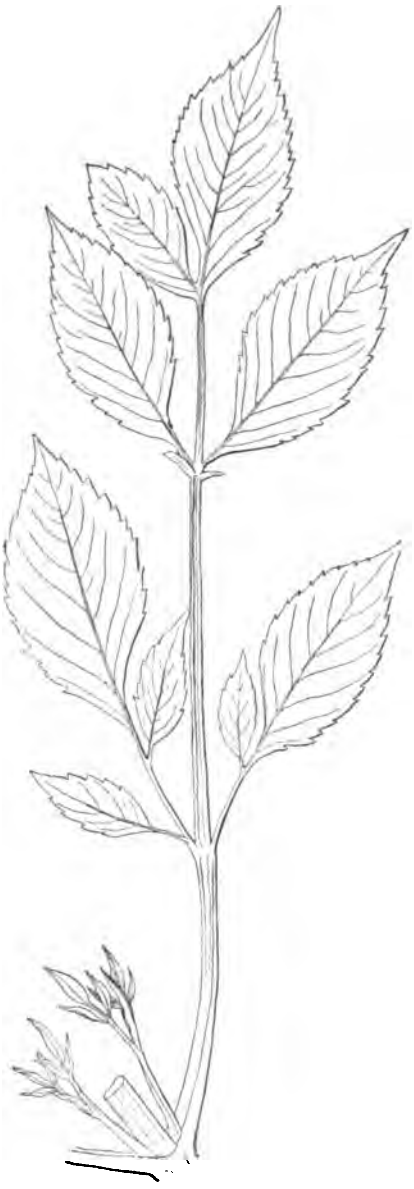
2483. Example of fasciation. A branch of ***Ailanthus glandulosus.***

2. *Longitudinal growth* in stem parts which normally remain short leads to the unusual separation of the leaves. This is especially noticeable when the floral leaves become thereby more or less widely separated. This is likely to be accompanied by transformation of the floral into green leaves, and sometimes by proliferation.

3. *Unequal growth* lengthwise produces apparently twisted stems, with irregular displacement of the leaves. Such displacement is especially noticeable when it affects whorled leaves, the whorls being stretched out into irregular spirals. Unequal growth in two dimensions by the tissues of a leaf produces the "curly" or crispate leaves, characteristic of many cultivated plants. Fig. 1267, Vol. 2.

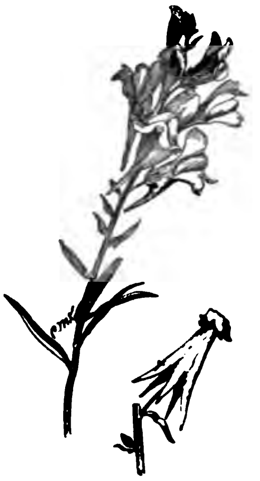
4. *Local deformities*, such as swellings, tubercles and galls of various forms, are usually due directly to the presence of a plant or animal parasite. Fungi, either inhabiting the particular region deformed, or more widely spread through the plant but forming eproductive bodies at the seat of the swelling, occasion excessive growth of some or all of the tissues. The "black-knot" on cherry and plum trees, the "plum pockets," the tubercles on the roots of clovers, peas and their kin, are a few out of the hosts of deformities of this kind, due to plant parasites, and known by various names.

Many insects, either in the course of feeding on plant juices, or by laying eggs on or in plants, or by reason of the temporary occupation of the part by the larval insect, bring about the formation of galls of various kinds on leaves, stem, or roots. The malformations produced are of the most varied shapes. Sometimes they are merely the production of an unusual number of hairs of special form; sometimes a leaf bulges out at one spot to form a deep pocket or pouch; sometimes the blade of a leaf is rolled or folded, with or without thickening; all degrees of thickening or outgrowths are produced, from a slight tumor to a perfectly globular apple-gall or even a cylindrical tube-gall; sometimes a bud has the number of its scales greatly increased to form a cone-like gall; or a flower is distorted until its nature is almost unrecognizable. The variety of form is almost as various as the insects and plants concerned. Indeed, the same insect at different stages of its development may produce galls of different sorts on the same plant. All orders of true insects except the Orthoptera and Neuroptera may produce galls, but by far the larger number are due to the gall-flies and saw-flies of the order Hymenoptera. The gall-apples of the oaks, the prickly galls of the rose, the irregular brown swellings on canes of the blackberry, and the smooth gall-apples of the willow leaves and twigs are well-known examples. The gall-gnats among the true flies (Diptera) also produce a large variety of malformations, of which the cone-like galls resulting from deformed buds of the willow and the goldenrod are best known. Plant lice (Aphidæ) are responsible for the large smooth red galls on the petiole of sumachs, and for the flattish serrated galls on elm leaves. The fusiform galls on stem of goldenrod and asters is caused by the larva of a moth. In addition to true insects, the mites produce almost as great a variety of galls, pouch-galls and leaf-rolling being especially conspicuous. The cause of these deformities is sometimes the chemical stimulus produced by the injection of substances ("poisons") at the time of egg-laying by the parent, in which case the gall develops around the egg; sometimes it is the mechanical stimulus due to movements of the larva, together with the chemical stimulus from its various excretions, in which case the gall develops after the hatching of the egg.



2484. Dahlia leaf, illustrating the branching of leaves.

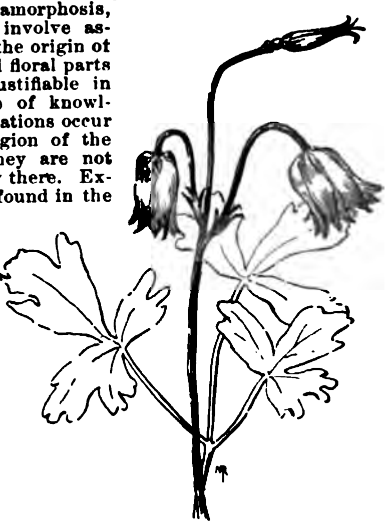
5. *Branching of leaves* is not infrequent, and its cause is unknown. "Four-leaved" clovers offer well-known examples, and the normal number of leaflets is often increased to six or even more. Fig. 2484 illustrates leaf-branching in the dahlia. Branching in the plane of flattening, both in foliage leaves and petals, has also been observed, and the branch described as an "outgrowth."



2485. Toad-flax — Linaria. Showing normal and abnormal flowers. Example of peloria.

6. *Peloria*. When usually irregular flowers, such as those with some spurred or saccate petals or sepals, develop all the parts of each set alike, thus becoming radially symmetrical, the phenomenon is called peloria. It was first observed by Linnæus in *Linaria vulgaris*, Fig.2485, and the term peloria, derived from the Greek word for monster, was given by him. Flowers often become peloric on account of changes in their relations to light, but other causes certainly coöperate. A reverse change, by which radial flowers become zygomorphic, occurs in many Compositæ when the corollas of disk florets become strap-shaped, as in the cultivated asters and chrysanthemums, but no notice seems to have been taken of it as a malformation. Sometimes all spurs fail to develop. Figs. 2486–7.

III. Transformation of Organs: *i. e.*, alterations more profound than those of form, which result in the production of organs different from those which normally occupy the position; often called metamorphosis. (The term substitution would be preferable at present, because non-committal as to processes and causes.) It is common to speak of progressive and retrogressive metamorphosis, but these terms involve assumptions as to the origin of foliage leaves and floral parts which are not justifiable in the present state of knowledge. Transformations occur chiefly in the region of the flower, though they are not found exclusively there. Examples are to be found in the development of leaves or leaflets as tendrils (Fig. 504); of sepals as petals; and of petals as stamens or pistils. These transformations are usually more or less imperfect. On the other hand, the pistils and stamens often develop as petals (Fig. 367), and many double flowers owe their fulness chiefly to such transformations, though other changes may coöperate as noted above. Fig. 2488. Petals may develop as sepals, bracts, or even imperfect foliage leaves, while sepals and bracts frequently become foli



2486. Lack of spurs in the columbine. Compare Fig. 2487.

ose. Indeed, all parts of the flower, even to the ovules, may appear as green leaves of more or less irregular shapes. To this category belong the so-called green roses, which are not uncommon.

IV. CONCRESCENCE. The actual union of parts may take place in the course of their development, though usually the apparent unions are to be explained quite otherwise (see *Flower*, p. 592), also Fig. 2489 (after Dudley).

The above include only the more common malformations, but on account of the extreme sensitiveness of plants to their environment and their great plasticity, all kinds of strange and curious deformities are possible. Malformations have little or no significance in elucidating the obscure problems connected with the historical origins of organs, or with their homologies, though many arguments, more ingenious than sound, have been based upon them.

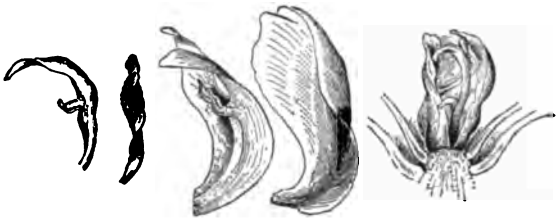
The most important general works are the following: Moquin-Tandon, "Eléments de tératologie végétal," Paris, 1841; Masters, "Vegetable Teratology," London, 1869; Penzig, "Pflanzen-teratologie," Genoa, 1890–4; in the latter the whole literature to date is cited. CHARLES REID BARNES.

TEREBINTH TREE. See *Pistacia Terebinthus.*

TERMINÀLIA (alluding to the leaves being borne on the terminus of the shoot). *Combretàceæ.* Nearly 100 trees or shrubs, with mostly opposite leaves which are sometimes crowded at the tops of the branches, giving them a whorled appearance. The flowers are small and sessile, mostly green or white, borne mostly in long spikes, perfect or polygamo-diœcious; petals none; calyx tubular and constricted above the ovary, the upper part urn-shaped or bell-shaped and 5-lobed; stamens 10, in 2 series: ovary 1, with a long style, 1-loculed. The fruit is a compressed winged nut-like body containing a large and often edible seed. Terminalias are tropical plants, chiefly of the Old World. One of them, *T. Catappa*, is widely cultivated in tropical countries. Two other names have appeared in the American trade: *T. elegans*, which is *Polyscias paniculata;* and *T. elliptica*, which is unknown to the writer and which is very likely to belong to some other genus.

2487. Normal columbine flower, with spurs present.

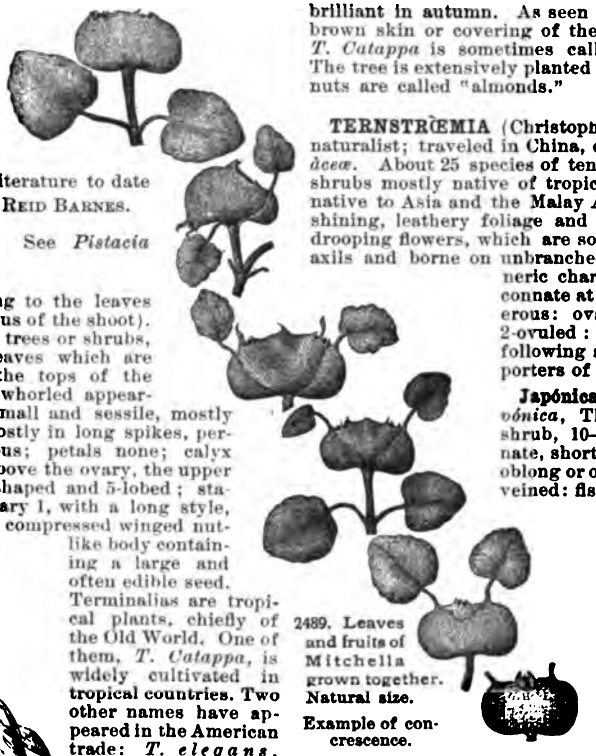
Catáppa, Linn. TROPICAL ALMOND. DEMERARA ALMOND. MYROBALAN. Fig. 2490. Tall deciduous tree (sometimes 80 ft.), with leaves and branches in horizontal whorls or layers: lvs. broadly obovate-obtuse, the narrow base slightly auricled or cordate, simple and entire, very short-petioled, 6–9 in. long: spikes solitary from the axils, not exceeding the leaves: fls. greenish white, the upper ones staminate and the lower ones perfect: fr. almond-shaped, 1½ in. or less long, 2-edged, indehiscent, glabrous, with a hard shell, containing an edible meat. Asia, but widely cult. B.M. 3004.—Cult. in South Florida. Useful both as a street tree and for its filbert-flavored nuts. The nuts are eaten either raw or roasted. Foliage is usually brilliant in autumn. As seen in the market, the outer brown skin or covering of the nuts is often removed. *T. Catappa* is sometimes called "Olive-Bark Tree." The tree is extensively planted in Porto Rico, where the nuts are called "almonds." L. H. B.



2488. Transformation of organs in a tulip flower.

TERNSTRŒMIA (Christopher Ternstrœm, Swedish naturalist; traveled in China, died 1745). *Ternstrœmiàceæ.* About 25 species of tender evergreen trees and shrubs mostly native of tropical America, a few being native to Asia and the Malay Archipelago. They have shining, leathery foliage and small, white, 5-petaled, drooping flowers, which are solitary or clustered in the axils and borne on unbranched peduncles. Other generic characters: sepals 5; petals connate at the base; stamens numerous: ovary 2–3-loculed; locules 2-ovuled: fr. indehiscent. The following species is offered by importers of Japanese plants.

Japónica, Thunb. (*Cleyèra Japónica*, Thunb.). Small tree or shrub, 10–12 ft. high: lvs. alternate, short-stalked, entire, obovate-oblong or oblong, glabrous, feather-veined: fls. clustered: berries about the size of peas. Japan. S.Z. 1:81. W. M.



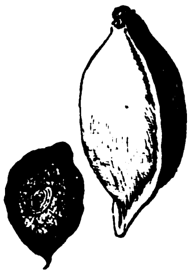
2489. Leaves and fruits of Mitchella grown together. Natural size.

Example of concrescence.

This rather showy and interesting evergreen shrub of dense bushy growth is flourishing finely in the writer's garden in Florida, in company with other choice shrubs and trees introduced into this country from Japan and China. The Ternstrœmia grows well in light, rich soil and attains finally the habit of a small, bushy tree. The young leaves have a reddish color, which changes to a dark glossy green when reaching their full size. My plants, raised from seed in the greenhouse and planted out in the garden when about ten inches high, have attained a height of six feet in five years. The plants have not yet flowered, but they seem to revel in the climate of Florida, being neither influenced by the occasional frosts in winter nor by the heavy rains in summer. In poor soil the color of the leaves has a yellowish hue, but as soon as they have received their share of bone or cottonseed meal they change to a fine deep green. H. NEHRLING.

TERRACE. Consult *Landscape Gardening.*

TESTUDINÀRIA (name explained below). *Dioscoràceæ.* The HOTTENTOT'S BREAD, TORTOISE PLANT or ELEPHANT'S FOOT, is a curious South African plant with a great globular yam-like bulb or rootstock which sometimes attains a diameter of 1–3 ft. and a weight of a hundred pounds. Half of this rootstock lies above ground and looks something like the back of a tortoise, whence the generic name Testudinaria. The popular name "Elephant's Foot" refers to the uncouth and massive appearance of the same thing. From the top of the rootstock grows a twining vine which attains a height of 8–10 ft., flowers from July to Nov., and dies down each season. The plant twines by means of the tips of the slender branchlets. It is a weak-looking growth to issue from such a mighty tuber.



2490. Nut of Tropical Almond—Terminalia Catappa (× ⅔). (See page 1785.)

The inner part of this "bulb" has been compared to a turnip for texture and color. The Hottentots used to cut it in pieces, bake it in the embers and eat it. Old and grotesque bulbs have from time to time been brought from the Cape as curiosities. A large specimen recently sold for $100. There are probably no large bulbs in the U. S., but seeds and seedlings are procurable in this country. The plant is of easy cultivation in a cool greenhouse. No method of propagating by the bulb is known.

Testudinaria is a genus of 3 species, all South African. It is closely related to the important genus Dioscorea, differing essentially in the seeds, which are samara-like, having a broad wing at the apex, while in Dioscorea the seed is winged all around or only at the base. Also the tubers of Dioscorea are all below ground and fleshy, while those of Testudinaria are half above ground and woody outside. Other generic characters of Testudinaria: fls. diœcious; male perianth bell-shaped, with a short tube and 6 subequal, oblanceolate segments; stamens 6; female perianth smaller: ovary 3-loculed; ovules 2 in a locule, superposed; stigmas 3, recurved, 2-lobed: capsule rigid, acutely triquetrous. Flora Capensis 6:252 (1896–97).

Elephántipes, Salisb. Rootstock studded with angular woody protuberances: stems slender, glabrous, much branched: lvs. alternate, suborbicular, 1–2 in. broad, entire, bright green or glaucous, mucronate: fls. small, inconspicuous, in racemes, greenish yellow or whitish. S. Africa. B.M. 1347. B.R. 11:921.

W. M.

TETRADÝMIA is a genus of low, rigid shrubs of the composite family native to the arid regions of western North America. The original species, *T. canescens*, is the best known. Its heads have only 4 flowers. They are yellow and about ½–¾ in. long. This plant was offered in the East in 1881 for western collectors but has no horticultural standing. For a full botanical account, see Gray's Synoptical Flora of N. A.

TETRAGÒNIA (Greek, *four-angled;* referring to the usually 4-angled fruit). *Ficoideæ* or *Mesembryaceæ*. Herbs or sub-shrubs from the southern hemisphere and Japan. Usually decumbent: lvs. alternate, short-petioled, somewhat fleshy: fls. yellow, green or reddish, axillary, apetalous; calyx 3–5-lobed. Only one species known in cultivation.

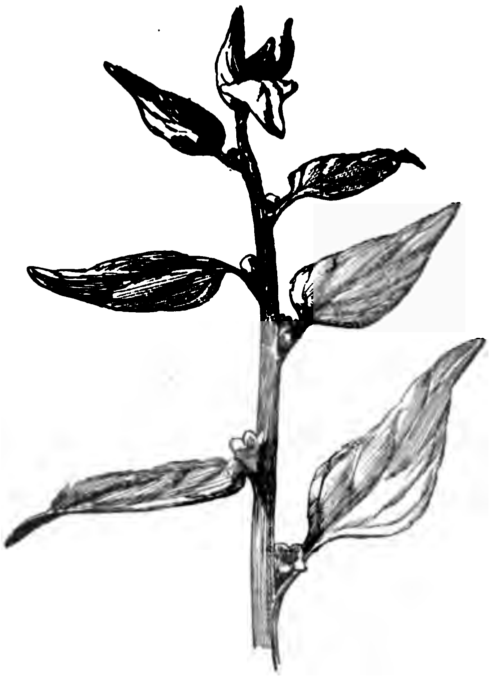
expánsa, Thunb. New Zealand Spinach. New Zealand Ice Plant. Fig. 2491. A hardy or half-hardy annual 3–6 in. high, often spreading 4–6 ft.: lvs. triangular, larger ones 4–5 in. long by 2–3 in. broad: fls. small, yellowish green. New Zealand. B.M. 2362.

New Zealand Spinach is chiefly useful for furnishing greens during the summer when the common spinach cannot be grown. It tastes a good deal like Spinach but is somewhat tougher as a rule. It is grown to some extent in California both for man and sheep. It readily self-sows.

For an early outdoor crop fresh seed should be sown in rich soil in a warm room early in January. The seed usually requires about 4 weeks to germinate. After growing about 2 weeks the seedlings should be transplanted to thumb-pots and about a month later to 4-inch pots. Growing vigorously in this condition they will be large enough to move into the garden toward the end of April, where they should be set 3–4 ft. apart each way, and as the plants grow will entirely cover the ground. They should be handled with great care in transplanting, otherwise growth will be so checked that it will require several weeks for recuperation. Again, plants should never be allowed to become potbound, as this will immediately bring them into flower and fruit and thus stunt their further growth, as well as greatly shorten their period of productiveness. Well-grown plants should be ready for use by June 1 and, if they continue vigorous, nearly a peck of greens can be gathered from each plant once a week until heavy autumn frosts. In gathering only 4 or 5 inches of the tip ends of the larger plants should be taken. In the South, it is usually dwarf, not generally exceeding 6–8 inches.

There is another and somewhat easier method of growing the crop, though a given area will be less productive. Inasmuch as the plant is a hardy annual, many seeds which ripen late in autumn will fall to the ground and germinate early in spring, though not early enough for the plants to be injured by spring frosts. These will be large enough for use toward the end of June. Annual crops are thus grown on the same ground several successive seasons with no care except removing old plants and keeping the new ones free from weeds.

For the forcing-house crop, seed should be sown during July in seed-beds where the plants remain until the latter part of September, when they should be taken directly to the benches and will be ready for use early in November. It is best to set the plants about 18 in. apart in benches at least 6 in. deep. No further attention is necessary except to give plenty of water, and under good conditions a peck of greens will be produced once a week on 4 square feet from November to May inclusive. A crop may also be grown beneath the benches near the walks, as well as in the grapery borders. Space that cannot be used for other purposes may thus be utilized to very good advantage, though they will not produce as abundantly.



2491. Tetragonia expansa (× ⅙).

This crop may also be grown in houses with portable roofs by starting the plants during summer in houses with the roofs removed, the roofs being replaced on the approach of cold weather. The plants will continue producing the entire winter and following spring, when they should be uncovered and will reproduce themselves in the same manner as the summer crop.

H. C. Irish.

TETRAMÌCRA (Greek words, referring to the *four small* divisions of the anther). *Orchidàceæ.* A genus of small terrestrial or epiphytic herbs of slender habit bearing racemes with few pretty fls. produced in spring. The erect stems, which are not pseudobulbous, grow from a creeping rhizome and bear 1–3 fleshy linear lvs. and a slender but rigid, terminal raceme: sepals and petals nearly equal, spreading; labellum joined to the base of the column; lateral lobes large, spreading or small, auricle-like, middle lobe large, entire, contracted at base, column with 2 wide wings; pollinia 4 perfect and 2 imperfect. Six species in Brazil and West Indies. Culture as for Lælia (p. 872).

bicolor, Rolfe (*Leptòtes bicolor,* Lindl.). Lvs. solitary on the short stem, semi-cylindric, with a furrow in front, 3–4 in. long: raceme few-fld., shorter than the lvs.: sepals and petals white, linear-incurved, over 1 in. long; lateral lobes of the lip small, folding over the column: terminal lobe oblong-lanceolate, bright rose, with white tip and margins. A pretty plant. B.R. 19:1625. A. F. 6:633. Var. **glaucophỳlla,** Hook. Lvs. glaucous. B.M. 3734. HEINRICH HASSELBRING.

TETRANÈMA (name refers to the four stamens). *Scrophulariàceæ.* A single little Mexican perennial herb, with many nodding purplish flowers crowded on the tops of radical scapes, and grown under glass or indoors for its profuse bloom. True stem very short or almost none: lvs. crowded at the crown or opposite on the very short stem, obovate or oblong-obovate, shallowly crenate-dentate: fls. purplish or violet spotted with lighter color in the throat; calyx 5-parted, the segments narrow and acute; corolla long-tubular, 2-lipped, the upper lip emarginate, the lower longer and 3-lobed; stamens 4; stigma capitate: fr. a 2-valved capsule. T. **Mexicànum,** Benth., is the only species, known as the "Mexican Foxglove" and formerly as *Pentstemon Mexicanus.* The pretty flowers are borne in profusion on the summits of slender purple scapes 6–8 in. high. Although essentially a summer bloomer, with good care it may be made to flower most of the year. It is usually regarded as a warmhouse subject, but it makes a good window plant and is easy to grow. Plants continue to bloom year after year. Prop. by seeds.
L. H. B.

TETRATHÈCA (Greek, *4-celled;* referring to anthers). *Tremandràceæ.* *T. ericifolia* is a heath-like Australian shrub which grows about a foot high and bears in July numerous 4- or 5-petaled pink fls., which open only in sunlight. The fls. are borne on slender pedicels and are solitary in the axils. This plant is cult. in S. Calif., having been introduced about 1900 by Mrs. T. B. Shepherd, who recommends it both for outdoor culture and for pot culture in the greenhouse, and adds that the fls. are pink or white, ½–¾ in. across.

Tetratheca is the largest genus of the family Tremandraceæ, of which a short account is given under *Platytheca.* It is an Australian genus of subshrubs with red or purple flowers. Eighteen species are discriminated in Flora Australiensis 1:129 (1863). They vary greatly in foliage, the lvs. being alternate, whorled or scattered, heath-like and entire, or flat and toothed, or reduced to minute scales. Generic characters: stamens apparently in a single series, the anthers continuous with the filament, 2-celled, or 4-celled with 2 of the cells in front of the 2 others, more or less contracted into a tube at the top: capsule opening only at the edges: seeds appendaged.

In European greenhouses all the plants of this family are considered difficult of cultivation. They are treated like many other Australian heath-like plants, being potted in fibrous peat and silver sand and watered carefully at all times. It is said that only soft rain water should be used. They are usually propagated by greenwood cuttings, but in California the seeds are offered.

ericifòlia, Sm. This species is distinguished from its congeners by its lvs., which are mostly verticillate and linear with revolute margins. Heath-like, tender subshrub, much branched and diffuse; sepals not reflexed: ovary with 2 superposed ovules in each locule or rarely a single ovule attached below the top of the locules. Very abundant about Port Jackson, N. S. Wales. W. M.

TEÙCRIUM (Teucer was the first king of Troy). *Labiàtæ.* GERMANDER. One hundred or more perennial herbs or undershrubs, mostly of the Old World, four of which are offered in the American trade. Lvs. opposite, entire or dentate: fls. mostly purple or pinkish, in whorls forming a terminal interrupted spike; calyx campanulate or tubular, more or less equally 5-toothed, 10-nerved; corolla with large lower lip, and the upper lip very small or split so as to appear to be wanting; stamens 4, in 2 pairs, exserted through the split or notch in the short upper lip. The Germanders are hardy herbs, with aromatic foliage, suitable for the wild garden or rockwork. They are little known horticulturally.

A. *Fls. in distinct 2–6-fld. whorls, forming a lax terminal inflorescence.*

Chamædrys, Linn. One to 2 ft. tall, from a decumbent base, branching, with age becoming woody below, pubescent or villous: lvs. ovate or oblong, petioled, incise-crenate, cuneate at the base, somewhat canescent beneath, the floral ones smaller and scarcely dentate: fls. bright rose, with red and white spots, ¾ in. long, rather showy, in many 2–6-fld. whorls. Europe.—A good border plant for late summer bloom.

AA. *Fls. solitary or not more than 3 at a whorl, forming a long terminal spike.*

Canadénse, Linn. Erect, 1–3 ft. tall, soft-pubescent or canescent: lvs. oblong-ovate to lanceolate, sharp-serrate: fls. purple to cream-color, the corolla about ½ in. long, the calyx canescent and the 3 upper lobes obtuse. Low ground, eastern states, from north to south. Mn. 8:97. — Offered by dealers in native plants. Useful for low grounds and moist borders. In general habit resembles a Stachys.

AAA. *Fls. on opposite axillary 1-fld. peduncles.*

frùticans, Linn. Shrubby, 2–3 ft., wide-branching: lvs. ovate, obtuse, entire, white- or brown-pubescent beneath: fls. on 1-fld. peduncles which are shorter than the calyx, blue, forming terminal or lateral clusters. Europe.—Recommended for dry places South. Has a long blooming season.

bicolor, Smith. Dwarf, herbaceous, glabrous: lvs. ovate, oblong or lanceolate, obtuse, entire or incised, green: fls. blue and white, on axillary 1-fld. peduncles. Chile.—Offered in S. Calif. L. H. B.

TEXAS, HORTICULTURE IN. Fig. 2492. The climatic belts of the state are distinctly marked and extremely different in character, one from another. They may be designated as follows:

1. The Gulf Coastal Plain.
2. The East Texas Forest Region.
3. The Red River Valley.
4. The Black Waxy Prairies.
5. The Brown or Chocolate Plains.
6. The Pecos Valley.
7. The Rio Grande Valley.

1. The Gulf Coastal Plain, extending out 50–75 miles from the Gulf of Mexico, varies in altitude from a few feet along the low sandy beach, to 50 and rarely 100 feet inland. Its surface in places is timbered with live-oak and pine, but mostly it is a level, black-sandy prairie. The streams are bordered in southeastern Texas with timber and undergrowth of many species, including the grand magnolia, holly, palms and many other beautiful flowering trees, shrubs and perennial herbs. The rainfall in the southwestern extension of this belt is much less than in the eastern, where it averages above 50 inches annually, and the growth and cultural conditions vary accordingly. In trucking, celery, cabbage, strawberries, tomatoes and melons are the leading items. On the southern end of Padre Island, near Brownsville, bananas, oranges and pineapples are grown to some extent. Figs flourish everywhere in the coast country. The canned-fig industry is developing and promises to become very profitable. Dewberries grow to perfection, and wild varieties are marketed in considerable quantities. The Le Conte, Keiffer and Garber pears do better in this region than elsewhere. Some of the Chinese Cling group of peaches,

also the Honey and Peen-to types, succeed well. Japanese plums, persimmons, and various American and foreign grapes also succeed, the latter requiring to be grafted on phylloxera-resistant roots, which are found in the numerous wild vines of the state.

Ornamental horticulture, in all its branches, is here characterized by a profusion and luxury of growth in foliage and flower of a semi-tropical nature. Ever-blooming roses continue to flower most of the winter. Broad-leaved evergreen trees and shrubs, known in the North only in conservatories, are here seen in all well-appointed private grounds and in parks and cemeteries. Cape jasmine hedges, with their dark glossy green foliage and pearly white, camellia-like, sweet perpetual flowers, are very popular. Commercial plant- and cut-flower growers do a good business in the cities of Galveston and Houston. During the winter holidays they collect from the woods great quantities of long ("Spanish") moss, holly, magnolia, mistletoe, palmetto, smilax, etc., and ship to northern cities for decoration purposes. In May and June they send to northern florists great numbers of cape jasmine and magnolia flowers.

2. The Great East Texas Forest Region lies just north of the eastern end of the Coastal Plain, the city of Beaumont being situated in its southern extremity. Extending westward from the Sabine river on the east to the Navasota river on the west, over 150 miles, and northward to Red river about 300 miles, narrowing somewhat in its northern parts, is one of the grandest and richest forests in America. Three species of fine lumber pines are most abundant. Numerous oaks, hickories, elms, maples, beeches, white and black walnuts, gums, poplars, pecans, lindens, magnolias, holly, persimmons, sassafras, and numerous handsome shrubs and perennial flowers are found almost everywhere, but especially along the streams. The soil is generally very sandy, underlaid with red and yellow clay, and well adapted to fruits of almost all kinds. The altitude varies from 100 to 600 feet. The rainfall is ample—from 40 to 60 inches annually—the climate is very mild, and altogether it is an almost ideal land in which to live easily and have a very paradise of a home, with a moderate activity of mind and body. Owing to the great lumber-mill interests, and lack of market facilities, nearly all horticultural pursuits have been overshadowed until recently. But at Palestine, Tyler, Troupe, Longview, Nacogdoches and some other points, large commercial peach orchards, berry plantations and canneries have been in very successful operation for a number of years and these interests are rapidly increasing. Railway facilities are growing, and altogether East Texas has a very bright horticultural future. Trucking of nearly all kinds, and fruit-growing, with berries, peaches, plums, apples (especially in northern parts), and pears, could hardly ask for better natural conditions. Until recently the settlers of this region were almost entirely from the older southern states and not very enterprising, yet very sociable, and their houses, yards and gardens are of the southern type. They earnestly desire enterprising, intelligent people from the North and East to take up their excellent, though cheap lands, and improve them.

3. The Red River Valley is a long extension to the westward—some 250 miles—of the soil, climatic and forest conditions of East Texas, excepting the pines, gums, and some other trees in its western parts.

But, as the Red river runs eastward in a broad, deep, heavily timbered valley, its southern bluffs, some 5 to 10 miles wide, enjoy peculiar immunity from late frosts. Here apples flourish about as well as in northern Arkansas, and peaches have not failed entirely in fruit during the twenty-five years of residence of the writer at Denison, Texas.

With the exception of a few of the tenderer shrubs, everything is grown here as well as in East Texas, and apples, grapes and some other fruits grow better and acquire higher color and flavor, owing to a less humid atmosphere. In this belt belong the cosmopolitan little cities of Texarkana, Paris, Sherman, Denison and Gainesville, in which are found many beautiful residences and grounds, many orchards, vineyards, and berry plantations. Railway facilities are excellent, and good markets lie in every direction. Trucking is also extensive. Cut-flower and general nursery business flourish in the places named. The people, coming from everywhere, are not at all clannish, but sociable and enterprising, with the northern types prevailing and northern ideas generally appear in the architecture and gardening, yet fine samples of the southern style are not infrequent.

Similar conditions prevail in some parts of the Trinity River valley as along Red river, especially about Dallas and Ft. Worth; also on the Brazos at Waco, but more of the southern type. These three cities nestle in the heart of the next great division.

4. The Black Waxy Prairie Region of Texas lies next to East Texas on the west and to the Red River Valley on the south, extending west to about 98° and south to within 150 to 100 miles of the Gulf, a broken irregular arm of the East Texas region extending southwestwardly between it and the Coastal Plain. This region has an altitude in its southern parts of 400 to 500 feet and rises in the northwest to 1,000 feet or more. The rainfall varies from 50 inches or more in its eastern parts to 30 inches in the western parts. The foundation is white, chalky lime-rock, the soil very black, sticky and exceedingly rich, highly adapted to grains, grasses and cotton, but not suitable for most fruits. The stone fruits and blackberries do best. Onions are largely grown in Collin county, of which McKinney is county seat. Most shrubbery does well. The Bermuda grass flourishes in Texas wherever grass can grow and is the almost exclusive lawn-grass. Very handsome yards are made by some of the farmers and many who live in the towns and cities; but most farmers in Texas have done little or nothing to beautify their homes horticulturally. Nowhere is this more apparent than in the Black Waxy Lands, the home being generally surrounded by corn-cribs, stock-pens, cotton-bins, and exposed farm machinery. There are splendid exceptions to these, demonstrating that very beautiful homes can be made even in the black lands of the state, where the richest general farming region exists.

5. The Brown, or Chocolate Plains Region of Texas, devoted principally to grazing and small grains, lies to the westward of the Black Land Region, is about 200 miles wide by 600 long, extending from Oklahoma on the north to the Rio Grande on the south, running from 1,000 feet altitude on the south and east to 3,000 feet on the west, where it ends suddenly against the cliffs of the still higher Staked Plains Region.

Horticulture is in its infancy in all this vast semi-arid, high, rolling prairie country, and can do little without irrigation. Yet many wealthy stockmen there have beautiful grounds surrounding their homes, and grow their home supplies of very fine fruits. Of commercial horticulture there yet is none. The same may be said of the Staked Plains Region, but its soil is dark rich loam, the country almost a dead level, except where cañons have cut into it, its altitude from 3,500 to 4,500 feet, its climate dry and very salubrious. Irrigation-horticulture in a small way is sustained from driven wells, which strike plenty of water at 10 to 30 feet. Stock-grazing is the only commercial occupation. Five or six counties northwest from Austin, in the central parts of the Chocolate Belt, are very broken, hilly and picturesque, well adapted to fruits. Nearly every home there is supplied with fruits, but stock-grazing is the chief occupation.

6. The Pecos Valley lies just west of the Staked Plains, and east of a spur of the Rocky Mountains. In places it is irrigated, as at Roswell and Carlsbad, N. M., and Pecos City, Texas. Commercial fruit-growing is considerable in this valley, especially at Roswell and Pecos City. At the latter place is a vineyard of 40 acres of the vinifera varieties, planted 8 or 10 years, doing finely on their own roots and very profitable, as the fruit goes to market in northern cities before any grapes are ripe in California.

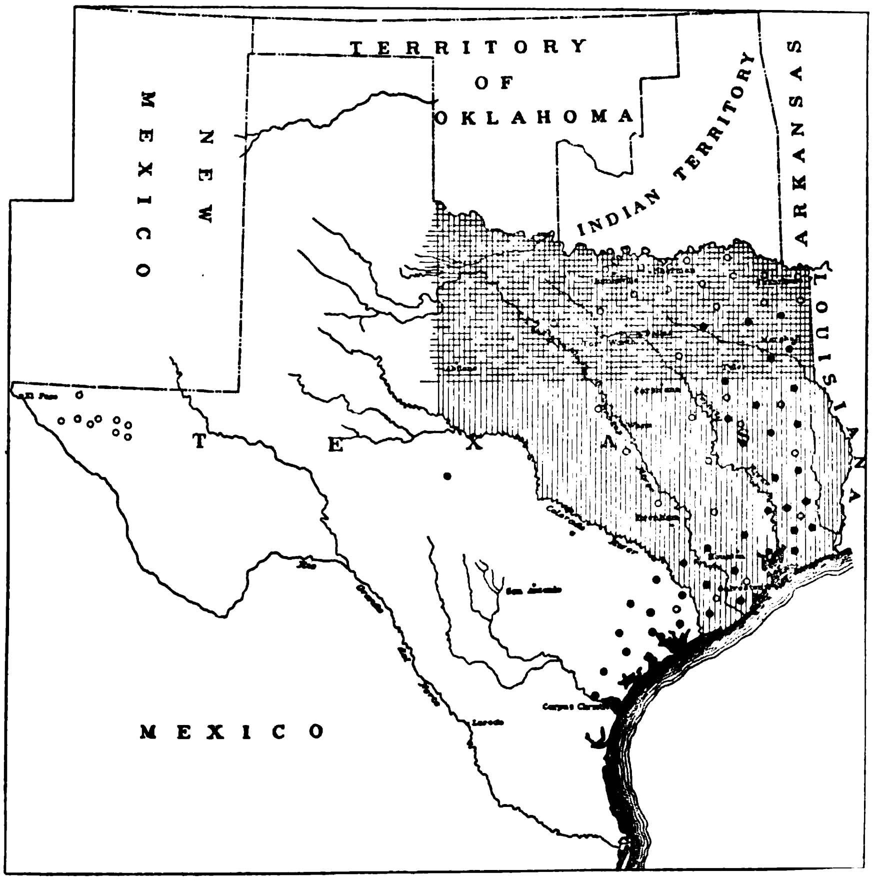
A vast mountainous and dry plains region extends from the Pecos to the Rio Grande, devoted to goats, sheep and cattle, yet at Ft. Davis, on a beautiful mesa, some 5,000 feet altitude, among mountains 2,000 to 4,000 feet higher, are a good many very beautiful homes, and fruits do finely, as there is sufficient rainfall and the air is very pure, so that diseases are almost unknown.

7. The Rio Grande Valley is much warmer in the same latitude than the Pecos valley, otherwise the horticultural conditions are pretty much the same.

At El Paso and Ysleta, a little way south on the Texas side, considerable quantities of vinifera grapes of table varieties are grown under irrigation and shipped to other Texas and to northern cities in August and September. Pears and plums are also grown to some extent. Farther down on the Rio Grande, at Del Rio, Eagle Pass and Laredo, grapes, figs and onions are considerably grown and shipped to the larger Texas cities and the North. The grapes are of the Old World varieties, and ripen in June; consequently have no competition and bring fine prices. The conditions are such that immense quantities of as fine grapes of this class can be grown in this part of Texas as in the best regions of California, and the cost of getting to market is not more than half as much. Undoubtedly the triangular region between San Antonio, Laredo and Del Rio will in the near future have extensive commercial vineyards of vinifera grapes.

The Spanish taste in home grounds among the wealthy of southwestern Texas, who are chiefly stock-growers and merchants, prevails largely. It consists of a plaza, or open square in the center of the residence, having fountains (where water is to be had abundantly), and borders, beds and vases of rare tropical and subtropical flowers, shrubs and fruits. Around this highly artistic garden the house is built, often of adobe, sometimes of stone, cut and carved, in large rooms adjoining and opening into each other, all on the ground-floor and one large door opening out to the street or small front yard from a big hall, sometimes having grand arches and marble columns. No windows are in the outside walls, except perhaps in the front, the rooms all being lighted from within the plaza. Thus great seclusion is secured and a perpetual conservatory scene is had from every room. Paved walks, usually covered, run around the plaza next the rooms and similar walks cross through the plaza.

The plaza-park prevails also in the finer hotels, as seen in some at San Antonio; and these, on an enlarged scale at various places in the denser parts of the city, give a very refreshing appearance. In the central and western parts of the state the northern and eastern style of park, cemetery and private grounds decoration is mostly copied, as is also the architecture. Some very creditable examples are seen in Dallas, Waco, Austin, Paris, Sherman, Gainesville, Fort Worth and other places.



2492. Texas Horticulture.

Circles indicate localities devoted to grape culture; black dots to strawberries; broken horizontal lines indicate areas suitable for apples; vertical lines for peaches.

There are numerous small, and a few fair-sized nurseries scattered over the state, chiefly in the Red River Valley and eastern Texas, as at Houston, or near there, Brenham, Austin, Dallas, McKinney, Ft. Worth, Denison, Bonham, Paris, Tyler, Gainesville.

Plant and cut-flower business is developing rapidly in the larger cities.

Seed business is almost entirely commercial or jobbing, few being engaged in growing seeds of any kind as a business and the supply comes from northern and eastern growers.

The Texas State Horticultural Society, organized in 1883 or 1884, is in a flourishing condition and meets annually with the Texas State Farmers' Congress, at College Station. There are several local horticultural societies in the state, and some 40 or 50 Fruit- and Truck-Growers' Associations for commercial purposes, with one general head to look after freight rates, distribution of products and placing in market. No state aid is given to any of the horticultural societies, yet during the last twenty-five years great developments in the various lines of horticulture have been made. Along with these developments have come varieties specially suited to the climates and soils, as few of the eastern and northern varieties were found adapted, or profitable. Some of these varieties that have originated in the state are given in the following lists.

T. V. MUNSON.

SOME FRUITS THAT ORIGINATED IN TEXAS.

Apples.

Aaron Holt,
Bledsoe,
Bruce (Bruce's Summer),
Doyle,
Gray,
Hamilton,
Heine,
Jones (Jones' Favorite),
Lincoln,
Rutledge,
Shirley,
Steward,
Stevens,
Talbot,
Texas Red,
Yellow Sweet.

Peaches.

Alice Haupt,
Barnes,
Bell (Bell's October),
Bessie Kerr,
Bonanza,
Burnet,
Cabler (Cabler's Indian),
Caruth (Caruth's Late),
Carman,
Chilow,
Clara Bruce,
Coleman,
Crimson Beauty,
Dulce,
Early China,
Early Beauty,
Eldred (Eldrea Cling),
Evening Star,
Family Favorite,
Galveston,
Governor Hogg,
Great Llano,
Guadalupe,
Holler,
Joe Johnson,
Lone Star,
Lulu,
Maggie Burt,
Mamie Ross,
Miss Lolo,
Morning Star,
November,
Old Alcalde,
Onderdonk,
Orman,
Orleana,
Pansy,
Pearson,
People (People's Cling),
Philip Horton,
Ramsey (Ramsey's Early)
Raisin (Raisin Cling),
Red River,
Rogers,
Rupley,
Scruggs,
Shipler,
Success,
Superb,
Texas King,
Texas,
Topaz,
Victor,
Ward.

Grapes.

America,
Atoka,
Bailey,
Beacon,
Bell,
Big Hope,
Brilliant,
Carman,
Champanel,
Delago,
Delicious,
Dr. Collier,
Elvicand,
Fern,
Gold Coin,
Headlight,
H. Jaeger,
Hopkins,
Husmann,
Kiowa,
Laussel,
Lukfata,
Marguerite,
Manito,
Mrs. Munson,
Muench,
Perry,
Presly,
Rommel,
R. W. Munson,
San Jacinto,
Wapanuka,
W. B. Munson,
Wetumka,
Xyluta,
Yamago.

Pears.

Alamo.

Plums.

African,
Beauty,
Bestofall,
Caddo Chief,
Captain (Columbia),
Clara,
Clark,
Clifford,
Coletta,
Crimson Beauty,
Drouth King,
Eagle,
Early Red,
Early Sweet,
El Paso,
Golden Beauty,
Gonzales,
Heep,
Holland,
Kanawha,
Lone Star,
Marianna,
Mason,
McCartney,
Minca,
Minland
Munson,
Nimon,
Nona,
October Red,
Ohio Prolific,
Piram,
Pontotoc,
Preserver
Ragland,
Roulette,
Sanders,
Saffold,
Transparent,
Texas Belle,
Waddell,
Watson,
Wayland,
Whitaker,
Wooten,
Yates.

Mulberries.

Spalding,
Travis,
Victoria.

Strawberries.

Parker Earle,
Hobson.

Blackberries.

Dallas,
Giant Pet,
Robison,
Jumbo,
Spalding.

Dewberries.

Austin-Mayes,
McDonald.
Pink,
White.

R. H. PRICE.

THÀLIA (J. Thalius, a German naturalist, and author of Sylva Hercynia, a catalogue of the plants of the Harz mountains; died 1588). *Scitaminàceæ.* About 7 species of tender American perennial, stemless, marsh herbs with large, long-petioled, often canna-like leaves and long scapes bearing large panicles of spikes of usually purple flowers. Fls. commonly 2 together in a 2-valved spathe; calyx minute; corolla tubular, with 6 divisions, of which the 3 interior are unequal; style thick, spiral; stigma 2-lipped, the lower lip long and pendulous: capsule inflated, 1-loculed, 1-seeded.

A. *Plant covered with a white powder.*

dealbàta, Fras. Stemless: petioles 1–2 ft. long: lvs. canna-like, cordate, ovate, 6–9 in. long: scape terete, 3–5 ft. high: panicles erect: spikes erect. June–Sept. Ponds and marshes, S. C. and west. B.M. 1690. B.B. 1:455.—A fine and stately aquatic when well grown. It should be placed in shallow water or in wet soil.

AA. *Plant not powdery.*

divaricàta, Chapm. Stemless: petioles longer than in *T. dealbata:* lvs. banana-like, 1–3 ft. long, oblong-ovate: scape 5–10 ft high: panicles 2–4 ft. wide: spikes zigzag, pendulous. Sept., Oct. Ponds, Apalachicola, Fla.—According to Reasoner Bros., this magnificent native ornamental-leaved marsh plant thrives in garden soil with cannas and like plants. Does well under cultivation in southern California.

F. W. BARCLAY.

THALÍCTRUM (ultimately probably derived from Greek *thallo,* to grow, but application doubtful). *Ranunculàceæ.* MEADOW RUE. Erect perennial herbs: lvs. ternately compound and decompound; stem-lvs. alternate: fls. diœcious, polygamous, or perfect in some species, rather small, generally greenish white or sometimes purple or yellow, borne in a panicle or loose raceme; sepals 4 or 5, deciduous; petals wanting; stamens many, showy: carpels usually few, 1-seeded. This group includes several forms which are well suited for the mixed border and rock garden. The robust forms are desirable for the wild garden. Many are very hardy, and only the more southern forms of those given below are at all tender. Thalictrums are valued for their feathery heads of flowers, contrasting with their handsome stems and leaves, which are often of a purple cast. They may be propagated by seed or by division of roots in early spring, just as growth begins. Any good loamy soil will suit them if well drained.

The latest monograph of the entire genus was published in 1885, by Lecoyer, in Bull. Soc. Roy. de Bot. de Belge, where he describes 69 species. In 1886 Wm. Trelease published a fine treatment of "North American Species of Thalictrum" in Proc. Soc. Bost. Nat. Hist. 23:293–304, in which he recognized 11 species and 4 varieties north of Mexico. His treatment is rather closely followed by Robinson in Gray's Syn. Flora, 1895. Since that time at least 10 new species have been described—chiefly from Mexico—several of which are by J. N. Rose, in Cont. U. S. Natl. Herb. 5:185, Oct. 31, 1899. All North American forms were treated by the present writer in Minn. Bot. Studies, Aug., 1900. Besides several native species, about 5 have been introduced to our gardens from other countries.

INDEX.

adiantifolium, 3.
adiantoides, 3.
aquilegifolium, 7.
Chelidonii, 10.
Cornuti, 7.
Delavayi, 10.
dioicum, 8.
Fendleri, 12.
glaucum, 4.
minus, 3.
occidentale, 11.
petaloideum, 1.
polycarpum, 13.
polygamum, 6.
purpurascens, 5.
purpureum, 3, 5.
saxatile, 3.
sparsiflorum, 2.
speciosum, 4.
venulosum, 9.

A. *Fls. perfect.*
B. *Filaments widened near the anthers: anthers ovate, obtuse.*
C. *Akenes sessile, in a head, ovate-oblong*.............. 1. **petaloideum**
CC. *Akenes stalked, widely spreading, straight along dorsal margin*.......... 2. **sparsiflorum**
BB. *Filaments filiform: anthers linear, acute or mucronate.*
C. *Fruits sulcate: stigma dilated on one side of the short style*................ 3. **minus**

cc. *Fruits longitudinally veined: stigma terminal, minute, not dilated, style short* .... 4. **glaucum**
AA. *Fls. polygamo-diœcious.*
B. *Anthers linear, mucronate: filaments thread-like* ...... 5. **purpurascens**
BB. *Anthers ovate: obtuse, filaments broadened above*..... 6. **polygamum**
AAA. *Fls. diœcious, with rare exceptions.*
B. *Filaments widened above: anthers ovate, rather obtuse.* 7. **aquilegifolium**
BB. *Filaments thread-like: anthers linear, acute or mucronate.*
C. *Mature fruits rather firm or thick-walled, not greatly flattened, filled by the seed.*
D. *Sepals green or greenish.*
E. *Blades of leaflets very thin*.................. 8. **dioicum**
EE. *Blades of leaflets firm, veiny below*......... 9. **venulosum**
DD. *Sepals purple*...........10. **Delavayi**
CC. *Mature fruits less firm, thin-walled, 2-edged, either flattened or turgid.*
D. *Leaflets very thin*.......11. **occidentale**
DD. *Leaflets firm.*
E. *Pistils 5–11 (rarely 13): akenes flattened*.....12. **Fendleri**
EE. *Pistils 7–20: akenes turgid* ....13. **polycarpum**

1. **petaloídeum,** Linn. Stem round, nearly 1 ft. high, almost naked: lvs. 3–5-parted; lfts. smooth, ovate, entire or 3-lobed: fls. corymbose, perfect; sepals white, rotund; filaments pink; anthers yellow: fr. ovate-oblong, striated, sessile. June, July. N. Asia. L.B.C. 9:891.—Not yet in American trade lists but well worth cultivating.

2. **sparsiflòrum,** Turcz. Stem erect, sulcate, 2–4 ft. high, branching, usually glabrous: lvs. triternate, upper ones sessile; lfts. short-stalked, round or ovate, variable in size and shape of base, round-lobed or toothed: fls. in leafy panicles on slender pedicels, perfect; sepals obovate, whitish, soon reflexed; filaments somewhat widened; anthers very short: akenes short-stalked, obliquely obovate, flattened, dorsal margin straight, 8–10-nerved; styles persistent. N. Asia, through Alaska to Hudson Bay, in mountains to Colorado and southern California.

3. **minus,** Linn. (*T. purpùreum*, Schang. *T. saxátile*, Vill.). Stems round, sulcate, 1–2 ft. high: lfts. variable, acute or obtusely lobed, often glaucous: fls. drooping, in loose panicles, perfect; sepals yellow or greenish: fr. ovate-oblong, sessile, striated. Summer. Eu., Asia, N. Afr.—A polymorphous species in the variation of the leaflets.

Var. **adiantifòlium,** Hort. (*T. adiantoides*, Hort. *T. adianthifòlium*, Bess.). Lfts. resembling those of Adiantum fern.—A form much used and admired.

4. **glaùcum,** Desf. (*T. speciòsum*, Hort.). Stems erect, round, glaucous, 2–5 ft. high: lfts. ovate-orbicular, 3-lobed; lobes deeply toothed: fls. in an erect panicle, perfect; sepals and stamens yellow: fruits 4–6, ovate, striated, sessile. June, July. S. Eu.

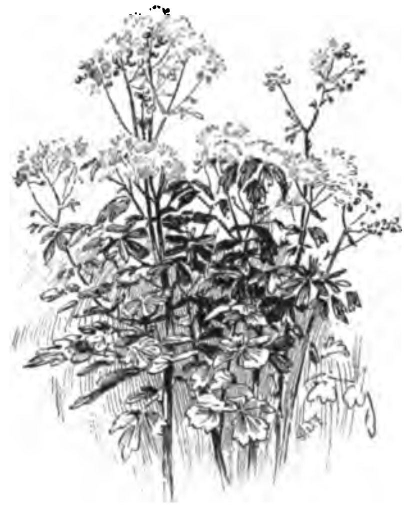
5. **purpuráscens,** Linn. (*T. purpùreum*, Hort.). A polymorphous species, allied to *T. polygamum:* stem 3–6 ft. high, branching above, leafy, pubescent or glabrous, sometimes glandular: lfts. larger than in that type: fls. in a long, loose, leafy panicle, polygamo-diœcious; filaments narrow; anthers rather long, taper-pointed: akenes slightly stalked, ovoid, glabrous or pubescent, with 6–8 longitudinal wings; style slender, persistent; stigma long and narrow. Canada to Fla., west to the Rockies. June–Aug.

6. **polýgamum,** Muhl. Tall Meadow Rue. Erect, 3–8 or more ft. high, branching and leafy, smooth or pubescent, not glandular: lvs. three to four times ternate or terminally pinnate; lfts. oblong to orbicular, bases variable, 3–5 apical lobes: fls. in a long, leafy panicle, polygamo-diœcious; sepals white; filaments broadened when young; anthers short: akenes ovoid, stipitate, 6–8-winged or ribbed, with stigmas as long, which become curled. July, Aug. Low or wet grounds, Canada to Fla., westward to Ohio.

7. **aquilegifòlium,** Linn. Feathered Columbine. Fig. 2493. Stems large, hollow, 1–3 ft. high, glaucous: lvs. once or twice 3–5-parted; lfts. stalked or the lateral ones nearly sessile, slightly lobed or obtusely toothed, smooth, suborbicular: fls. in a corymbose panicle, diœcious; sepals white; stamens purple or white: fr. 3-angled, winged at the angles. May–July. Eu., N. Asia. B.M. 1818; 2025 (as var. *formosum*). Gn. 47, p. 357; 50, p. 117.—The old name *T. Cornùti*, Linn., may be a synonym of this, and if so it is the older name, being published on a preceding page, but *T. Cornuti* was described as an American plant, while *T. aquilegifolium* is not. As the description and old figure of *T. Cornuti* do not agree with any American plant, the name may well be dropped. Those plants advertised as *T. Cornuti* are probably *T. aquilegifolium* or *T. polygamum*.

8. **diòicum,** Linn. Rather slender, 1–2 ft. high, glabrous: lvs. three to four times 3-parted; lfts. thin, orbicular, several-lobed or revolute, bases variable: fls. in a loose, leafy panicle with slender pedicels, diœcious; stamens much longer than the greenish sepals; anthers linear, obtuse, exceeding their filaments in length: akenes ovoid, nearly or quite sessile, longer than their styles, with about 10 longitudinal grooves. Early spring. Woods, Labrador to Ala., west to the foot of the Rockies.

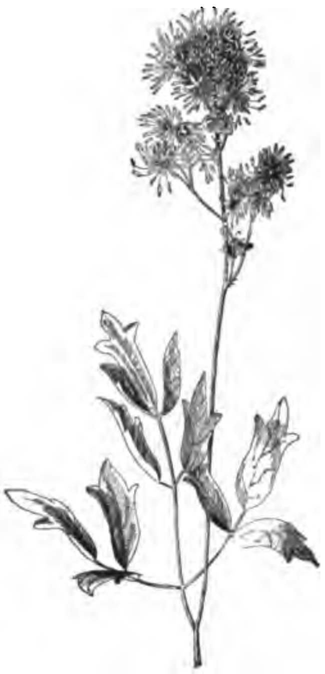
9. **venulòsum,** Trelease. Allied to *T. dioicum:* stem simple, erect, 10–20 in. high, glabrous, glaucous, bearing 2–3 long-petioled lvs. above the base: lvs. three to four times 3-parted; lfts. short-stalked, rather firm, rounded and lobed at the apex, veiny beneath: fls. in a simple panicle, diœcious, small; sepals ovate; stamens 10–20, on slender filaments; anthers oblong, slender-pointed: akenes nearly sessile, 2 lines long, ovoid tapering to a straight beak, thick-walled and 2-edged. S. Dak. westward and southward in the mountains.



2493. Thalictrum aquilegifolium (× ¼).

10. **Delavàyi,** Franchet. Slender, 2–3 ft. high, glabrous: lower lvs. on long, slender petioles, two to three times 3–5-parted; lfts. long-stalked, 3–5-lobed, base cuneate, rounded or cordate: fls. pendulous, diœcious; sepals purple or lilac, ⅓ in. long, equaling the slender stamens, anthers linear: carpels 10–12: fr. winged at

the three angles, stipitate. Summer. Mts. of E. China. B.M. 7152. G.C. III. 8:125.—A close ally of *T. Chelidonii* of the Himalayas so much admired in Europe. Well worth introduction.



2494. Thalictrum Fendleri (× ⅙).

11. **occidentàle**, Gray. Allied to *T. dioicum*, which it closely resembles, but it is more robust and taller: lvs. glandular-puberulent: akenes long, slender, thin-walled, 2-edged, ribbed, not furrowed.

12. **Féndleri**, Engelm. Fig. 2494. A variable species. Plants 1–3 ft. high, rather stout and leafy: lvs. four to five times pinnatifid, upper stem-lvs. sessile; lfts. rather firm, ovate to orbicular, usually with many shallow rounded or acuminate lobes; bases variable: fls. diœcious, in rather compact panicles; stamens many, anthers long: akenes nearly sessile, obliquely ovate, flattened, 3–4 ribs on each face. July, Aug. W. Texas to Montana.

13. **polycárpum**, Watson. Allied to *T. Fendleri:* glabrous throughout: lfts. long-petioled. fls. diœcious, in rather close panicles: akenes larger, in a dense globose head, short-stalked, obovoid, turgid, tapering into reflexed styles. Summer. Sandy streams, Calif. to Columbia river.

K. C. Davis.

THAMNOCÁLAMUS. See *Bamboo*, p. 127.

THAMNÓPTERIS (Greek, *bushy fern*). *Polypodiàceæ.* A genus of simple-leaved ferns growing in crowns, sometimes united with Asplenium. The elongate indusia are in parallel rows on the veins of the banana-like lvs., often extending nearly to the margins. The veins are free below but are united at the apex by a transverse intramarginal vein.

Nidus, Presl. (*Asplènium* and *Thamnópteris Nìdus-Avis*, Hort.). Bird's Nest Fern. Lvs. bright green, growing in a crown, 2–4 ft. long, 3–9 in. wide, the midrib rounded and usually green. Japan, East Indies. **T. strictum**, Hort. (*Asplenéndrium strictum*, Hort.), is a more slender, upright form said to be a garden hybrid between *T. Nidus* and *Sclopendrium crispum*.

T. Australàsicum, Hook. Differs from the above in its midrib, which is keeled on the back and often black. Sometimes regarded as a variety. Australia.

L. M. Underwood.

THÁSPIUM (name a play upon *Thapsia*, another genus of the same family). *Umbelliferæ.* Meadow Parsnip. A genus of 3 species of hardy perennial herbs of eastern North America with ternately divided leaves (or the lower undivided), and terminal umbels of yellow or purplish flowers.

aùreum, Nutt. Stem branched, 1½ ft. high: root-lvs. mostly cordate; stem-lvs. ternate; lfts. ovate to lanceolate, serrate: fls. yellow. June, July. Var. **trifoliàtum**, Coult. & Rose, with crenate lvs. or lfts., is a common western form. Var. **atropurpùreum**, Coult. & Rose, fls. dark purple. The species is of easy culture in any ordinary soil. In the wild state the plant grows in at least partial shade. Well-grown plants, especially of var. atropurpureum, make attractive specimens.

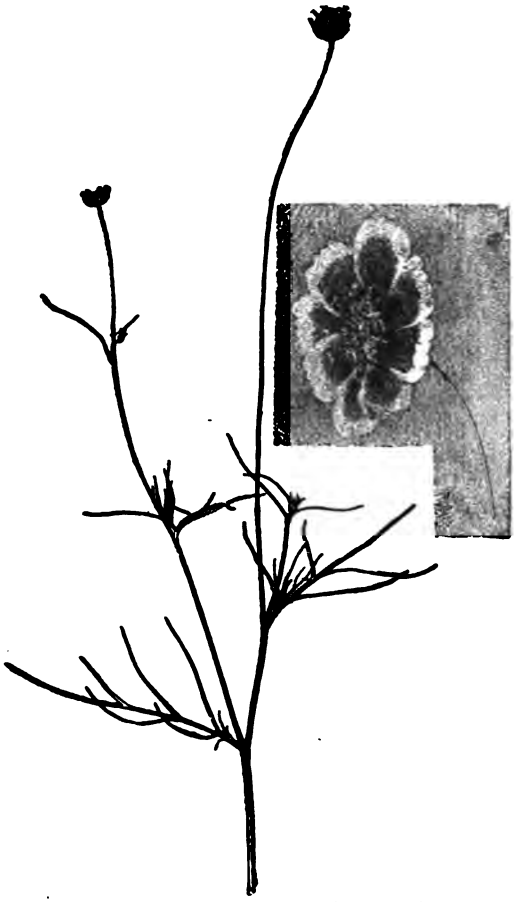
F. W. Barclay.

THÈA. See *Tea* and *Camellia*.

THELESPÉRMA (Greek, *wart, seed;* the seeds are often papillose). *Compósitæ.* A genus of about 8 species of annual or perennial herbs, rarely shrubby at the base, native to the extra-tropical regions of North and South America. They are smooth herbs with aspect of Coreopsis, with much cut leaves and long pedunculate flower-heads, typically yellow rays and yellow, sometimes purplish or brownish, disk-flowers. The genus may be separated from Coreopsis by the form of the involucre, which is in 2 series of bracts with the inner series united to about the middle into a cup, while in Coreopsis the 2 series are distinct and united only at the very base. The seeds, especially the outer ones of the head, in Thelesperma are often tuberculate.

hýbridum, Voss (*Cosmidium Burridgeànum*, Hort.). Fig. 2495. A hardy annual, 1½ ft. high, a hybrid of *T. filifolium* and *Coreopsis tinctoria*, from the latter of which it acquires the brown-purple color of its rays. Lvs. bipinnately divided into filiform lobes not wider than the stem.

F. W. Barclay.



2495. Thelesperma hybridum (flower × ¾).

THEOBRÔMA. Commercial Cacao or "Cocoa" is produced by trees belonging to the Linnæan genus Theobroma. The estates devoted to its culture are usually known as "Cacao plantations" and are largely on the increase in all suitable climates, owing to the increased demand for the manufactured article in the different forms in which it is now prepared for consumption. The larger proportion of commercial Cacao is produced by *Theobroma Cacao*. Other species native to central America and the West Indies are *T. pentagona*, *T. spe-*

ciosa, *T. angustifolia* and *T. bicolor*. *Theobroma sylvestris*, Aubl. (*T. Martiana*, Dietr.) is sometimes referred to as a native, but does not appear to have been recorded by modern writers for Central America and the West Indies.

Theobroma pentagona is a species which in vigor of growth and productive capacity resembles to a very large degree the generally cultivated varieties of *T. Cacao*, but it differs in the flowers, in the size of the beans, and especially in the shape of the pods. The beans are larger in size than those of *T. Cacao*, fully equal if not superior in flavor, and are capable of being worked up in the same way as the commoner species. This kind is known on the mainland as "Alligator" Cacao, from the fancied resemblance of its skin to the hide of an alligator. The outside of the pod is soft and easily broken, and does not afford such good protection to the interior as the harder shell possessed by *T. Cacao*. In Nicaragua *T. Cacao* and *T. pentagona* are grown together, and the produce is mostly a mixture of the two species. From the presence of *T. pentagona*, it is possible that hybridisation has taken place between two species. It has been noted that the pods of *T. Cacao* produce much larger seeds or beans in Nicaragua than in countries where this species is not grown in company with *T. pentagona:* and the beans of the two species are almost impossible to distinguish when cured together. The product of Nicaraguan plantations also requires much less time for fermentation than the produce of Grenada, Trinidad or Venezuela, some forty-eight hours being the usual period, while more than four times that number of hours will be required for the proper fermentation of the produce of the last mentioned countries.

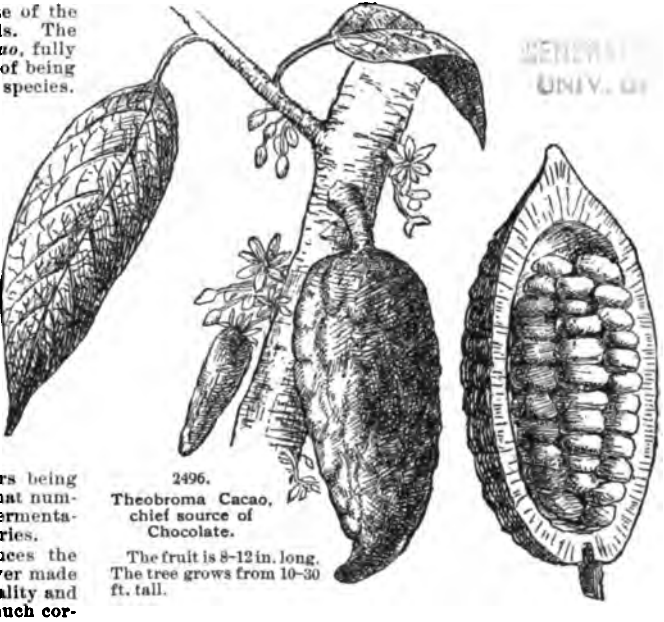
Theobroma speciosa is a plant that produces the "Monkey Cacao" of the mainland. This is never made into market Cacao, as it is very inferior in quality and has a disagreeable flavor. The pods are hard, much corrugated, warted, and of a dirty brown color when ripe.

Theobroma bicolor is a very distinct species in every way. The leaves are large, and in the juvenile stages of growth are broadly cordate in form, and only assume the mature or oblong form on reaching the third or fourth year's growth. The pods are oval, ribbed and netted, hard and woody, with an outer shell half an inch in thickness which can only be cut with a saw. The seeds are oval, much flattened, with a dark, hard and smooth exterior. The interior is white, and has a somewhat nutty flavor. They are used in sweetmeats in the same way as almonds, but cannot be made into commercial Cacao, suitable for the manufacture of chocolates. This species, though without doubt a true Theobroma, is very widely distinct from any of the varieties of *T. Cacao* which produce commercial Cacao. The produce of *T. bicolor* is known in some parts of Central America by the names of "Wariba," "Tiger," and "Pastaste" Cacao.

Many names have arisen for the varieties of *Theobroma Cacao* which are in cultivation, as many as forty having been listed by a Trinidad cultivator of large experience. Looking at the matter from a practical point of view, all these are merely strains of the one species, produced by natural cross-fertilization of the older types. According to Hart's "Cacao," Trinidad, 1900, there are but three major strains or classes of *T. Cacao*, respectively, "Criollo," "Forastero," and "Calabacillo." The type of the first is found indigenous in Trinidad and various places on the mainland, its distinctive character being its bottle-necked pod, with a thin skin and finely ribbed exterior, together with its white or whitish seeds or beans, which are mild in flavor and somewhat rounded in form.

The characters of "Forastero" are its roughly corrugated or verrucose pod, containing large flattish seeds, of a purplish color. It is a tree having greater vitality than "Criollo," and gives a much larger crop. "Forastero" means foreign, and this type is said to have been found on the mainland of South America, whence it was imported to Trinidad by Arragonese Capuchin Fathers about 1757. (De Verteuil, History of Trinidad, 1884.)

"Calabacillo" is the third form, its chief characteristics being the vigor of its growth and its small flat and strongly flavored bean. By some it is considered as a degraded form of Forastero.



2496. Theobroma Cacao, chief source of Chocolate.

The fruit is 8-12 in. long. The tree grows from 10-30 ft. tall.

GENERAL UNIV. OF

While the above gives a brief sketch of the chief characters of the principal types, it must be understood that there are varieties intermediate between the forms; in fact, on the majority of estates it is impossible to find any two trees exactly alike in all their botanical characters, occurring, without doubt, from the uninterrupted cross-fertilization which has taken place. Still, each country appears to maintain certain characters more permanent than others, and thus secures for itself a name upon the markets of the world. It is probable that this is due, in a measure, to the unconcious preference taken by some to distinctive features of the produce by the continuous cultivation of a fairly fixed strain which has arisen. It may also be due in some measure to the influence of climate and environment. Certain it is, however, that there are to-day strains of Cacao which are possessed of distinctive characters, not readily produced by any process of preparation in places other than that in which they are grown. A fine set of illustrations of varieties common to different countries has lately been published in a work by Dr. Paul Preuss, who recently traveled in Cacao-producing countries on behalf of the German government.

These different brands are bought by manufacturers and blended to suit their particular market, but there are certain kinds possessing special flavor which are readily sold at high value. The value of the commercial product fluctuates and the price rules considerably lower than some years ago. Whether this results from increased production or from a deterioration in the quality cannot be ascertained. It is clear that if cultivators grow Cacao for seed without regard to the best rules of selection, the quality must deteriorate. What mitigates this fact is that all the Cacao world has, up to a recent date, followed the same practice. The process of grafting, to which the Cacao tree readily submits, as was recently proved in Trinidad, will enable operators to make large fields of the choicer varieties, and it may be confidently expected that in a few years a great improvement will be shown in the various grades placed upon the market. But little Cacao is manufactured in the countries where it is grown, except for home use, and then generally in a crude manner.

Chocolate is the term used for sweetened and hardened preparations of the roasted and ground Cacao bean, with the larger proportion of the original fat retained, while the so-called "Cocoa" preparations are the same material in fine powder, sweetened or unsweetened, but with the greater proportion of the Cacao fat extracted. This fat, when clarified, is a pure white substance, almost as hard as beeswax, and is used in many pharmaceutical preparations. Chocolate and Cocoa are both made from the beans or seeds of *Theobroma Cacao* and *T. pentagona*, and only differ in the method of preparation.

The word "Cocoa" is a market corruption of the original Spanish "Cacao," which was adopted by Tournefort as a generic name but has since been displaced by the Linnæan Theobroma. J. H. Hart.

THEOPHRÁSTA (Theophrastus was a Greek naturalist and philosopher, 370–285 B.C.). *Myrsinàceæ.* According to Bentham & Hooker, this genus has but a single species, *T. Jussieui*, of San Domingo. J. Decaisne, in Annales des Sciences Naturelles for 1876 (ser. 6, Bot. 3) contrasts three species. Pax, in Engler & Prantl's "Pflanzenfamilien," written later than either of the above, recognizes four species. Five names occur in the American trade, only one of which is a true Theophrasta according to either of the above authorities. This is *T. Jussieui*. Three of them are to be referred to the related genus Clavija, and one (*T. imperialis*) is now regarded as a species of Chrysophyllum (of the family Sapotaceæ). The chief technical differences between Theophrasta and Clavija are in the flowers and fruits. In Theophrasta the corolla is cylindrical and shallowly 5-lobed; staminodia attached on the base of the corolla: fr. large and many-seeded. In Clavija the corolla is subrotate and deeply 5-cleft; staminodia attached on the tube of the corolla; fr. 1–many-seeded. Theophrasta itself includes a glabrous shrub with erect, nearly simple stem, the simple lvs. crowded at the ends of the branches, the fls. large, white, in racemes. The fls. are perfect and gamopetalous; calyx and corolla with 5 divisions that are imbricated in estivation, the corolla bearing a corona in the throat; stamens 5, fixed at the bottom of the corolla-tube; pistil one, with short style and capitate stigma. Fr. fleshy and apple-like, many-seeded. The species referred to Theophrasta in the American trade are handsome large foliage plants for warmhouse culture. An allied genus is Jacquinia, which see.

The following cultural note is probably applicable to the various species cultivated under the name of Theophrasta: According to T. Baines in Gn. 1:395, *T. imperialis* is of easy culture, enduring a winter temperature of 45° without injury but making the best growth with 70° night temperature and 10° rise during the day. It has the objection of being almost impossible to root from cuttings. A plant that has become too large may have part of the top cut off and all the buds removed from the stem down to within a few inches of the ground, which operation causes the plant to sprout from the base. One only of the sprouts should be left; when it is well started the old stem may be cut down and after waiting until a little more growth has been made the plant should be taken from the pot, and be cleaned of soil and dead roots and repotted.

A. *Juice milky.*

imperiàlis, Linden (properly *Chrysophýllum imperiàle*, Benth.). Lvs. obovate-oblong to oblong-oblanceolate, 3 ft. long on large plants: fls. yellowish green, small, in pediculate clusters on the lower branches: fr. 5-angled, nearly globular, 1–2 in. thick. Brazil. B.M. 6823. I.H. 21:184.—This species has been cultivated since the middle of the nineteenth century as Theophrasta, but upon flowering in European gardens was found to belong to Chrysophyllum, a genus of the family Sapotaceæ.

AA. *Juice not milky.*

B. *Corolla mostly deep but the limb shallow-lobed: fr. many seeded (Theophrasta).*

C. *Trunk or stem not spiny.*

Jussieùi, Lindl. Lvs. linear-spatulate, about 1½ ft. long and about one-sixth as wide, obtuse, strongly spinose-dentate, with black-tipped teeth, the midnerve very strong and the secondary ones confluent at the margins: inflorescence racemose, the racemes axillary and loose-fld.: fls. rather long-pediceled, bracteate, the calyx-lobes ovate and erose-dentate, the corolla tubular-campanulate, white, the corona annular and entire. San Domingo. G.C. III. 2:429.—It is not known to the writer whether the plant in cult. in this country under this name belongs to this species or one of the two following.

fúsca, Decne. (*T. Jussiæi*, Hort.). Stem simple, with ash-gray bark: lvs. linear or linear-spatulate, 18 to 20 in. long and about 2 in. wide, obtuse, varying from nearly entire to repand-denticulate to strongly spinose, midnerve strong and tawny red at the base, the secondary nerves confluent at the leaf-margin: inflorescence paniculate or racemose, the racemes short and densely fld.: fls. on slender pedicels, bracteolate, the calyx-lobes orbicular and ciliolate, the corolla urceolate-campanulate, dull brown, the corona 5-lobed. Probably West Indian, but the species founded on cult. specimens.—The name *T. fusca* is not known to occur in the American trade.

CC. *Trunk spiny.*

densiflòra, Decne. Stem with black spines, the bark brownish: lvs. linear-oblong, 14–16 in. long and 2–2½ in. wide, coarsely spinose-dentate, the secondary veins numerous and crowded and somewhat pellucid: inflorescence terminal and corymb-like, compact, the branches 5–6-fld.: fls. short-pediceled, campanulate and white, the calyx-lobes ovate and somewhat ciliate and equaling the corolla-tube, the corona 5-lobed. San Domingo. B.M. 4239 (as *T. Jussiæi*).—The name *T. densiflora* is not known to occur in the trade.

BB. *Corolla mostly shallow and deep-lobed: fr. often 1–few-seeded (Clavija).*

C. *Leaves obtuse.*

macrophýlla, Hort. (properly *Clavìja grándis*, Decne.). Lvs. large, arcuate, obovate-spatulate and obtuse, entire or sinuate-repand; petiole thick and dark violet, the secondary nerves slender and simple or forked: fls. orange-yellow, in short, erect racemes; calyx-lobes orbicular and nearly glabrous, the corona 5-lobed. Brazil. B.M. (as *Clavija macrophylla*) 5829.

CC. *Lvs. acute.*

longifòlia, Jacq. (properly *Clavìja ornàta*, D. Don). A tender tree, often 20 ft. high: lvs. crowded, subverticillate, oblong-spatulate to lanceolate, narrowed at the base, mucronate, spinosely dentate, 1–1½ ft. long, about 9 in. wide: racemes 4–10 in. long, usually pendulous: fls. fragrant, saffron-colored. Peru. B.M. 4922. B.R. 21:1764.

latifòlia, Willd. (properly *Clavìja latifòlia*, C. Koch). A tender tree: lvs. oblong, petioled, narrowed at both ends, mucronate-serrate: racemes erect. W. Indies.—The species seems to be imperfectly known to botanists.

L. H. B.

THERMÓPSIS (Greek, *lupine-like*). *Leguminòsæ.* A genus of about 15 species of perennial herbs native to North America and northern and eastern Asia. They are erect plants with large, 3-foliolate, stipulate leaves and showy yellow or purple flowers in terminal or axillary racemes. The following species are all handsome hardy perennials bearing yellow flowers in early to late summer. They are not particular as to soil or position, but do best in a deep, light, well-drained soil. They are generally deep-rooted plants and endure drought very well.

Propagation may be effected by division, especially in *T. montana*, *T. fabacea* and *T. rhombifolia*, which spread extensively by the root, but in general the better way is by seed, although the seed is rather slow to germinate and should be sown as soon as ripe or in the spring with some heat.

A. *Pod strongly recurved.*

rhombifòlia, Richards. Plant about 1 ft. high, branched: lfts. usually oval or obovate, ½–1 in. long: fls. in a compact spike: pod glabrous. June, July. Western states. B.B. 2:265.

AA. *Pod straight or only slightly curved at the apex.*

B. *Plant 3–5 ft. high.*

Caroliniàna, M. A. Curtis. Stem stout, smooth, simple: lvs. long-petioled; lfts. obovate-oblong, silky beneath; stipules large, clasping; raceme 6–12 in. long, erect, rigid, many-fld.: pod 2 in. long, erect, villous and hoary. June, July. Mts. of N. C.

BB. *Plant 1–3 ft. high.*

C. *Stipules longer than the petiole.*

montàna, Nutt. Plant 1½ ft. high, somewhat silky-pubescent: lfts. oblong-obovate to oblong, 1–3 in. long: fls. in long spikes: pod straight, erect, pubescent. May, June. Western states. B.M. 3611. B.R. 15:1272 (both erroneously as *T. fabacea*). Sometimes called "Buffalo pen" in the west.

CC. *Stipules shorter than the petiole.*

D. *Racemes axillary.*

fabàcea, DC. Resembles *T. montana* and has possibly been confounded with it in the trade. It differs in having more spreading pods and larger and more compressed seeds. May, June. Siberia.

DD. *Racemes terminal.*

móllis, M. A. Curtis. Stem erect, branched, 2–3 ft. high, pubescent: lfts. obovate-oblong, 1–2 in. long: racemes 6–10 in. long: pod slightly curved at the end, 2–4 in. long. May–July. Va. and North Carolina.

T. Cashmeriàna, Hort. Saul, does not appear to be known to botanists. J. B. KELLER and F. W. BARCLAY.

THESPÈSIA (Greek, *divine;* application doubtful). *Malvàceæ*. A genus of a few species of tall trees or shrubs native of tropical Africa, Asia and the islands of the Pacific. They have the aspect of Hibiscus and may be distinguished by the confluent stigmas, more woody capsule and the obovoid compressed seeds.

popúlnea, Soland. A small tree with the younger portions covered with peltate scales: lvs. long-petioled, ovate, cordate, acuminate, 3 in. across: fls. axillary, 2–3 in. across, yellow. Trop. Asia, Africa and the islands of the Pacific.—Cult. in S. Calif., where, according to Franceschi, it succeeds only in warm and moist locations. He also notes the fls. as varying from yellow to purple. F. W. BARCLAY.

THEVÈTIA (André Thevet, 1502–1590, a French monk who traveled in Brazil and Guiana and wrote a book on French Guiana in which the plant is mentioned). *Apocynàceæ*. A tropical American genus of about 7 species of trees or shrubs with alternate, 1-nerved or lightly penniveined leaves and rather large yellow flowers in terminal few-flowered cymes.

Thevetia nereifolia, the Yellow Oleander of Florida gardens, is a very ornamental small evergreen shrub, growing luxuriantly in rich, sandy soil, not too moist and not too dry, ultimately attaining a height of 6 to 8 feet and almost as much in diameter. The foliage is abundant, light glossy green and reminds one of the oleander, but the lvs. are narrower. The pale yellow flowers are abundantly produced. The fruit, which is of the size and somewhat of the form of a hickory nut, is regarded as poisonous by the negroes. The Thevetia can stand a few degrees of frost, but it was killed outright on February 7, 1895, when the thermometer went down to 18° F. If banked with dry sand in fall it does not suffer much, though the top may be killed.

A. *Lvs. 8–10 in. long, about 2 in. wide*

nítida, DC. A tender shrub: lvs. oblong-lanceolate, acuminate, margins revolute: fls. rather large; corolla white, with a yellow throat. West Indies; cult. in southern Calif.

AA. *Lvs. 3–6 in. long, less than ½ in. wide.*

nereifòlia, Juss. Known locally in Florida as "Trumpet Flower" and incorrectly as "Yellow Oleander." A tender shrub: lvs. linear, shining, margins revolute: fls. about 3 in. long, yellow, fragrant. West Indies, Mexico. B.M. 2309 (as *Cerbera Thevetia*).—Cult. in S. Fla. and S. California.

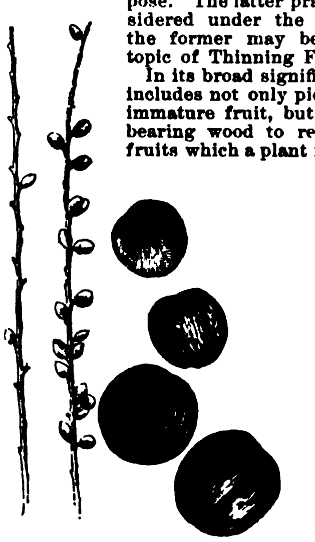
F. W. BARCLAY and H. NEHRLING.

THIMBLEBERRY. *Rubus occidentalis* and *odoratus*.

THINNING FRUIT. All fruit grows larger and better, and often becomes more highly colored, other things being equal, when it has an abundance of readily available food. The supply of crude food materials is increased by allowing room enough to each plant and by enriching the soil and keeping it sufficiently moist. The plant may set so many fruits, however, that it cannot possibly grow all of them to large size even though an abundant supply of crude food material is readily available. The leaves build up the crude materials taken from the soil and air into organic compounds which the plant must have to sustain its life and support its growth. Fruit-growers often fail to recognize that the fruit depends upon the leaves most directly connected with it for elaborated food, which alone can nourish it. It is nevertheless true; and for this reason, even when there is no crop on the rest of the tree an overloaded branch needs to have its fruit thinned to secure the highest possible number of fine large fruits.

By reducing the number of fruits the proportion of elaborated food for those which remain is increased. Sometimes checking the too vigorous growth of the vegetative parts is also resorted to for the same purpose. The latter practice is properly considered under the subject of *Pruning;* the former may be treated under the topic of Thinning Fruit.

In its broad significance Thinning Fruit includes not only picking off some of the immature fruit, but also any pruning of bearing wood to reduce the number of fruits which a plant is allowed to produce. Such pruning is usually done when the plant is in a dormant condition. It may be performed on grapes in autumn as soon as the leaves fall. It is then easy to cover the vines if winter protection is needed. The more hardy orchard fruits may be attended to at any time when the leaves are off; the more tender kinds should be left till the severities of winter have passed, so that the amount of bearing wood which is taken off may be varied in proportion to the loss of fruit-buds by winter injury. The work on peaches and apricots is thus sometimes deferred till the trees bloom, or even later.



2497. Thinning fruit.

(Drawn from photographs and reduced to ⅓ natural size.) The large separate fruits indicate the relative gain in size in thinning plums. The right-hand twig shows relative stage of development at which peaches should be thinned; the twig at the left indicates relative distance between thinned peaches.

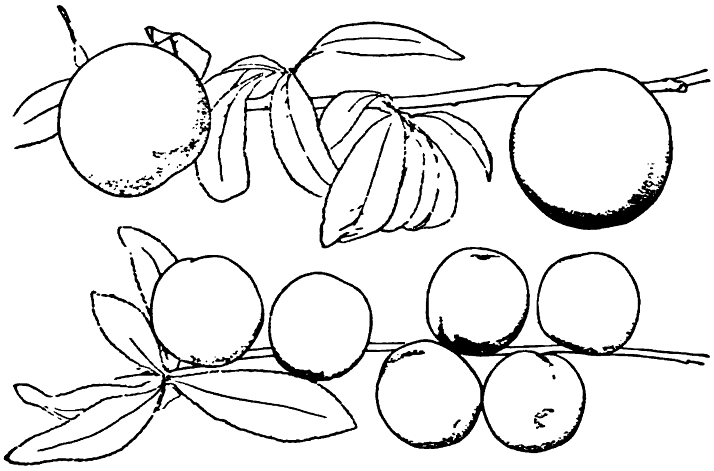
The sooner a fruit can be relieved from struggling with other fruits for its food the better its chances are for reaching extra large size. It is, therefore, best to reduce the amount of bearing wood before the blossoms open, as much as can safely be done.

Perhaps a method of thinning orchard fruits by treating the open blossoms with some spray mixture may eventually be perfected. This would give the fruit the advantage of an increased food supply from the time the blossoms opened. It is known that such treatment may prevent the setting of fruit. It remains to demonstrate whether by a judicious use of this method the setting of fruit too abundantly may be prevented. If this can be done successfully, much labor in thinning by picking off immature fruit might be thus avoided.

To avoid the extra labor which would be required by thinning immediately after the fruit sets, it is customary to defer the work till the weaker fruits drop.

Very often the mistake is made of deferring it too long. The labor spent in late thinning is usually wasted so far as improving the grade of fruit is concerned. Although the yield is thus lessened, the ripe fruit generally averages but little if any larger than unthinned fruit.

No definite rule can be given as to the amount of fruit to be left in thinning. This should be determined according to the environment, vigor and productive habits of the plant. Generally speaking, fruits should be thinned so that those which are left are separated from each other by a distance of at least three times the diameter of the largest fruits at maturity. Under irrigation, or where a constant plentiful supply of soil moisture can be depended on, the number of fruits which the plant may be allowed to bear is much greater than, in some cases even twice as great as, the same plant could bring to large size if it were located on drier soil. Fig. 2497 shows the stage of development of peaches for early thinning and indicates the percentage removed and distance apart of those which are left.


2498. The results of thinning Japanese plums. Lower branch not thinned.

Immature plants should not be allowed to bear a full crop. It is generally best that the plant carry but few fruits for the first crop. Afterwards it may be burdened more heavily, till finally, when a vigorous mature plant is developed it may safely bear a full crop. In consequence of overbearing, immature plants are often so weakened that they are easily winter-killed; or they may be left in an unthrifty condition from which they do not recover in several years if at all. In thinning fruit on immature plants, the natural ability of the plant and the influence of environment should be even more carefully considered than with mature plants. This work requires skill and good judgment, which can only be acquired by experience, study and careful observation.

The question of what kinds of fruit it is best to thin should be considered briefly from the standpoint of the commercial grower. If the markets which are accessible do not pay more for the better grades of fruit there can be no profit in thinning except in preventing the breaking down of the tree by heavy crops and, possibly, from increasing the tendency to annual bearing. The crop of thinned fruit may sometimes exceed the measure that the unthinned fruit would yield, but not enough to pay for the cost of thinning if the crop is sold at no advance in price over unthinned fruit.

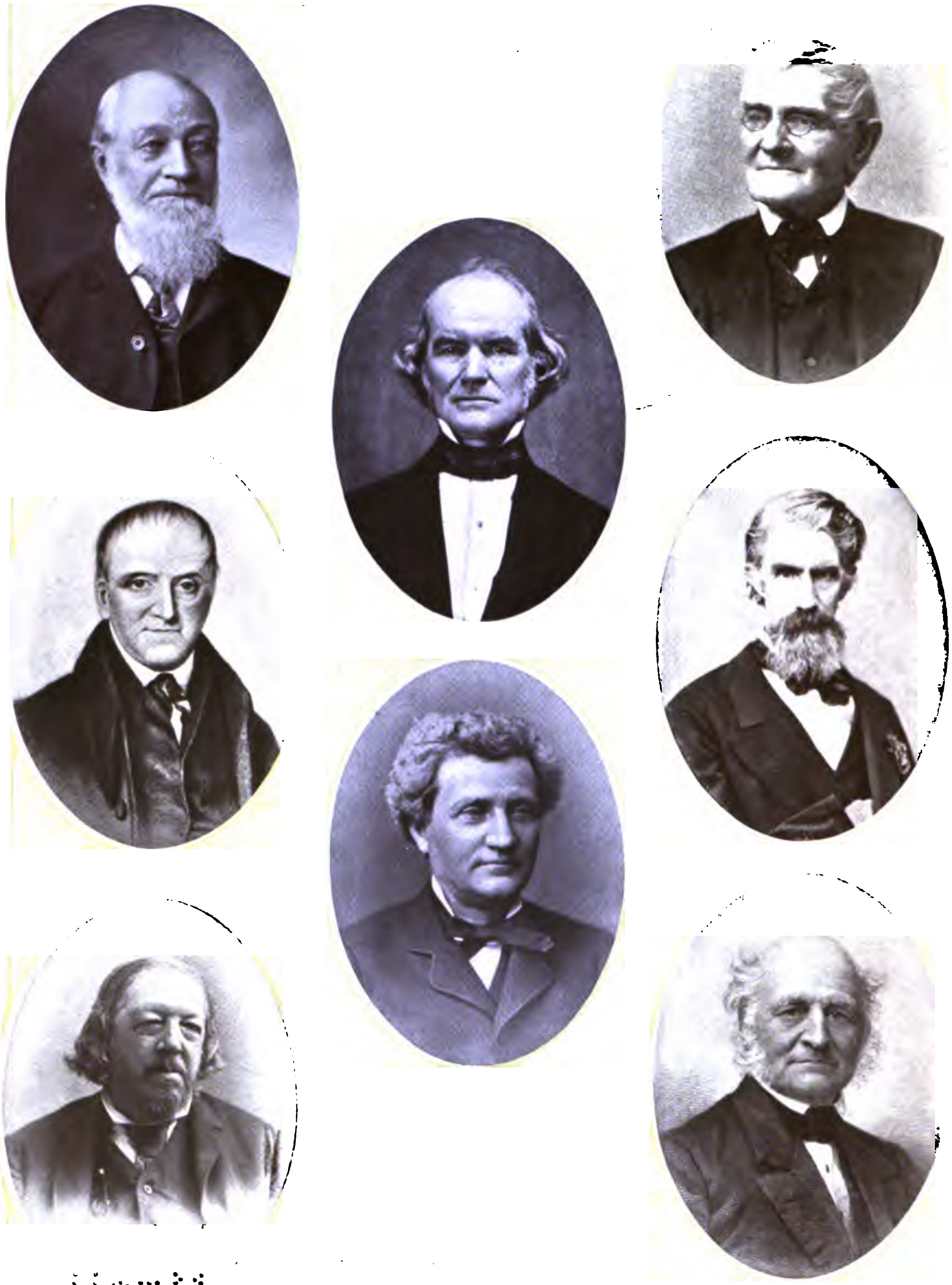
Where fancy prices are obtained they are brought by evenly graded packages of the larger specimens. Varieties which at their best run small or medium size do not usually pay for thinning. It does not pay, for instance, to try to increase the size of Damson plums by thinning them. Plums like Lombard or Burbank, which have medium to large fruit, may pay for thinning. Fig. 2497 shows the improvement in size attained by thinning the Burbank. Those plums which at their best produce very large fruit, such as Wickson, Diamond and Guii, usually give better returns for thinning. With all kinds of fruit, thinning may be expected to return most profit when practiced on varieties well adapted for fancy trade.

An exceedingly heavy crop of fruit may so exhaust a tree that it either fails to fruit the next year or produces less than an average crop. Such a result is more often seen with some kinds of fruit than with others, and different varieties of the same kind of fruit may vary much in their natural tendencies in this direction. By judicious selection of varieties and by skilful management much may be done towards securing more regular bearing and more abundant crops. Thinning fruit has a place in the management of the commercial fruit plantation, along with the maintenance of soil fertility, tillage, pruning and spraying. It is a mistake to depend on thinning alone for results which may with difficulty be obtained by all these methods combined. In some careful experiments vigorous, mature, well-nourished trees on which the fruit had been systematically thinned annually, bore no more regularly than corresponding trees on which the fruit was not thinned. In other cases the beneficial effects of thinning were unmistakably apparent in somewhat increased fruitfulness the following season. The profit from thinning fruit in any one season comes largely from the increased amount of the better grades of fruit which are obtained by the process. The yield the succeeding year may or may not be greater because the fruit was thinned.

S. A. Beach.

Thinning Fruit has now come to be an established horticultural practice with those who cater to the best markets and aim at the highest ideals in fruit culture. Thinning assists the grower in securing several results, chief among which are the following: (1) in maintaining the vigor of the tree; (2) in producing fruit of maximum size, appearance and quality; (3) in securing annual crops instead of alternate, and (4) in preventing the spread of parasitic diseases.

It does not pay to thin all classes of fruit. Only early or fancy varieties of apples will reward the cultivator for the expense and labor of thinning, though it usually pays to pick the earliest varieties successively, removing the largest and best colored specimens first, which in effect is a process of thinning. Standard pears are to be classed with apples; dwarf pears are partly thinned by winter pruning, and partly by the removal of surplus fruit in summer. Stone fruits pay for thinning more amply than other kinds. Peaches and plums may be thinned by winter pruning, but this is often inadequate. Our best peach-growers now thin to 6 and 8 inches apart and find that when this is coupled with high culture the results are usually satisfactory. Whether it will pay to thin plums or not will depend upon the variety and the market. The Japanese varieties are much improved in appearance and quality by judicious thinning. The larger varieties of the domesticas may under favorable circumstances be profitably thinned, but the wisdom of thinning the smaller varieties of natives and domesticas must be determined by the individual grower. Many varieties have a tendency to overbear; these should be thinned in the interest of the health and vigor of the tree. Grapes respond to thinning by increased size of bunch and berry, but there is little or no money in the operation, except where the fruit is grown for a very special market or for exhibition purposes. Thinning the grapes should be accomplished by close winter pruning. Strawberries are thinned by special methods of culture, such as growing in hills and narrow matted rows. The way in which the operation is performed varies somewhat with



U OF M

Plate XLI. Prominent American Horticulturists the fruit. Sometimes small shears are employed, but as a rule the fingers and thumbs of an active man are the most effective instruments available. Practice gives deftness. Eight to ten mature peach trees constitute a day's work. As to time, while it is important to thin early in the season, experience has shown that much labor is saved if the work is deferred until the "June drop" or first drop after the setting of the fruit occurs. After this, thinning should be done promptly. JOHN CRAIG.

THISTLE. **Blessed T.** See *Carbenia.* **Cotton T.** See *Onopordon.* **Globe T.** See *Echinops.* **Golden T.** See *Scolymus.* **Scotch T.** See *Onopordon.*

THLADIÁNTHA (Greek, *to crush* and *flower;* the author of the genus is said to have named it from pressed specimens). *Cucurbitàceæ.* A genus of 4 species of tender, diœcious, herbaceous vines with tuberous roots, usually ovate-cordate leaves and axillary, yellow flowers. The genus is native of southern and eastern Asia and the island of Java. Male fls. solitary or racemed; calyx-tube short, bell-shaped, the bottom shut by a horizontal scale; segments 5, lanceolate; corolla bell-shaped, 5-lobed, the lobes revolute half way down; stamens 5: female fl. with calyx and corolla of male; ovary oblong; style 3-cut: seeds many. Thladiantha has recently been offered in this country under the name of Golden Creeper.

dùbia, Bunge. A tall climber with light green foliage and numerous yellow bell-shaped flowers: male fls. solitary in the axils without bracts: fr. ovoid-oblong, about 2 in. long, red: seeds black, smooth. Summer. N. China. G.C. III. 28:279. B.M. 5469 (male fl. only).—According to R. I. Lynch, in Gn. 56, p. 518, the plants are of easy cultivation and by planting both sexes and artificial pollination the fruit may be grown. He further states that the root-tubers are without buds but form buds just before growth commences, as does a root-cutting. According to Danske Dandridge, the plant is hardy in W. Va., increasing rapidly by tubers and becoming a pest when planted with choicer plants.

F. W. BARCLAY.

THLÁSPI (Greek, *crushed;* referring to the strongly flattened pods and seeds). *Cruciferæ.* A genus of 25–30 species of annual or perennial herbs, mostly from the temperate and alpine regions of the northern hemisphere. Mostly inconspicuous plants with radical rosettes of leaves and leafy scapes of small white, rose or pale purple flowers. **T. arvénse,** Linn., known as PENNY CRESS, is a naturalized annual weed from Eu., 4–12 in. high, simple, with terminal clusters of small flowers; sepals greenish; petals white. **T. alpéstre,** Linn., is a perennial species native of the Rocky Mts. An early-flowering alpine plant of a tufted habit, variable but usually 2–4 in. high: sepals purplish; petals white. Has been offered by collectors and is a neat little rock plant. It should be given shade and a cool, moist soil. V. 23:299. It differs from the European *T. alpestre,* but apparently not by any good specific character.

F. W. BARCLAY.

THOMAS, JOHN JACOBS (Plate XLI), one of the three pomologists who may be said to have created the science in this country (the others being Patrick Barry and the elder Downing), was born January 8, 1810, near the lake in central New York—Cayuga—on the shores of which he passed his life; and died at Union Springs, February 22, 1895. He was much more than a pomologist, his studies covering nearly every branch of rural industry except the breeding of live stock, and his labors in the direction of adorning the surroundings of country life entitling him to rank in that department with the younger Downing. Two of his works, "Farm Implements and Machinery," and the series of nine volumes called "Rural Affairs," deal with the practical every-day matters of life on the farm in a manner at once pleasing and original, there being nothing that could quite fill their place in the whole range of our agricultural literature; and his incessant stream of inspiring editorials in "The Cultivator" and "The Country Gentleman" for nearly sixty years covered a wide and diversified range of rural topics. But pomology was his chief delight, and his fame rests mainly on his treatise on that subject, "The American Fruit Culturist." This immensely useful book first appeared, in 1846, as a paper-covered 16mo of 220 pages, with 36 wood-cuts, which must have been well received, inasmuch as a fourth edition (dignified with muslin binding) was published in the following year, and in 1849 another, enlarged to 424 duodecimo pages, and "illustrated with 300 accurate figures." This edition appears to have been reissued a few years later, with slight modifications and on larger paper, and was then called the seventh.

Up to this time, the changes in the work had been chiefly in the direction of natural growth. But horticultural knowledge was undergoing great modification; and in 1867, the public still calling for the book, it reappeared in different style, newly arranged and mostly rewritten, filling now considerably more than 500 pages, and accompanied by almost that number of illustrations. Rather unfortunately, this was called the "second edition," all its predecessors being probably regarded as different forms of the same book, while this was substantially new.

The next edition, called the "eighth revised," appeared in 1875, and had nearly 600 octavo pages and over 500 engravings,—not to mention a colored frontispiece and highly pictorial binding; and this was followed, ten years later, by a revised reprint in plainer and more tasteful style, illustrated with the largest number of engravings yet reached, 519. This edition, the last issued during the life of the author, sold well, like all the others, and was long out of print and much sought for. A so-called "twentieth" edition, revised and enlarged by Mr. William H. S. Wood, a lifelong friend of the author, with the assistance of a number of high authorities, appeared in 1897, and contains over 700 pages and nearly 800 illustrations. Personally, Thomas was one of the most lovable of men. A consistent but very liberal-minded member of the "orthodox" branch of the Society of Friends, he exemplified in a marked degree the peculiar virtues, both robust and gentle, which so commonly command, for the adherents of that simple and unobtrusive faith, the respect and admiration of those who know them. GILBERT M. TUCKER.

THORBURN, GRANT (Plate XLI), founder of the seedhouse of J. M. Thorburn & Co., New York, and horticultural author, was born in 1773 in Dalkeith, Scotland, and early came to New York to seek his fortune. His father was a wrought-nail maker, and the son engaged in the same trade in this country. He soon married, and his wife attended a store which he established in Nassau street, near Liberty, for the selling of "tape, ribbons, thimbles, thread, scissors, and Oxbery's needles." The living rooms were in connection. "A glass door opened opposite the fireplace, where she rolled the dumpling or broiled the steak with one eye, and kept a squint on the store with the other." The introduction of cut-nail machines deprived young Thorburn of his trade, and the establishment of a pretentious grocery business on the corner of Nassau and Liberty streets took away his customers. He therefore gave attention to other means of livelihood. The women of the city had begun to show a taste for flowers. These were grown in pots, and the pots were sold by grocers. In the fall of 1802, there being various pots in his stock, Thorburn thought to attract the attention of purchasers by painting the pots green. Four pots were first painted. They sold quickly. Then he painted twelve. They sold; and thus the pot business grew. Thorburn had been in the habit of buying his meat at the Fly Market, at the foot of Maiden Lane. In April, 1803, he bought a rose geranium there, thinking to be able by its means to still further advertise his pots. But the next day a customer bought both pot and plant; and Thorburn quickly returned to the market and bought two more plants. These sold; and thus the plant business grew.

The man, George Inglis, of whom Thorburn bought the plants, was also a Scotchman, and it was soon agreed that one should grow the plants and the other sell them. But the customers also wanted to grow plants, and they asked for seed; and as there was no seed store in New York, it was arranged that Inglis should grow seeds also. This was in 1805; and in that year Inglis, as an experiment, had grown a lot of seeds. Thorburn bought these seeds for $15; and thus arose the first regular seed store in New York, and one of the first in the United States.

The seeds and plants continued to sell, and Thorburn was obliged to import seeds. In 1805 or 1806 he obtained a catalogue of William Malcolm & Co., London, the first plant catalogue he had ever seen, and he then published one of his own. This led to more pretentious writing, and "The Gentleman and Gardener's Kalendar" was the first outcome. The third edition of this, in 1821, by "Grant Thorburn, Seedsman and Florist," contains the advertisement of "G. Thorburn & Son," dealers in seeds, implements and rural books.

Grant Thorburn was a prolific writer for the current press on a variety of topics, under the *nom de plume* of Laurie Todd. He was a unique character, and his history,—"mixed with much fiction," as he himself says,—was the basis of John Galt's tale in three volumes (London, 1830) of "Lawrie Todd, or Settlers in the Woods." Thorburn left a most interesting autobiography, which was published in New York in 1852. He died in New Haven, Conn., January 21, 1863, at the age of 90. The portrait in Plate XLI is reproduced from his autobiography.

L. H. B.

THORN. See *Cratægus.* **Christ's T.** is *Paliurus Spina-Christi.* **Jerusalem T.** is *Paliurus Spina-Christi;* also *Parkinsonia aculeata.* **Swallow T.** is *Hippophaë rhamnoides.*

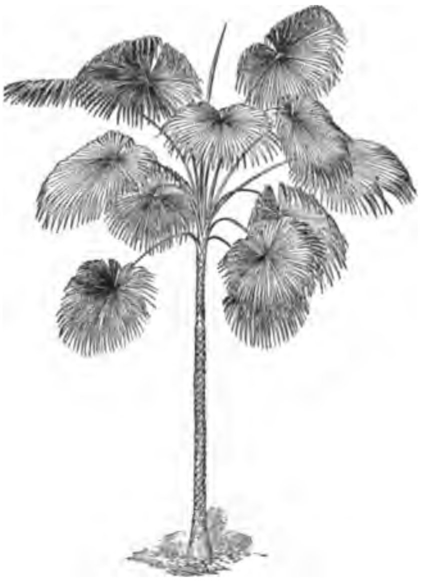
THORN APPLE. *Datura Stramonium;* also *Cratægus.*

THORN BROOM. *Ulex Europæus.*

THOROUGHWORT. *Eupatorium perfoliatum.*

THRIFT. *Armeria.*

THRÌNAX (Greek, *fan*). *Palmàceæ.* About 10 species of fan palms native to the West Indies and Florida. Spineless palms: trunks low or medium, solitary or cespitose, ringed below, clothed above by the fringed leaf-sheaths: lvs. terminal, orbicular or truncate at the base, flabellately plicate, multifid; segments induplicate, bifid; rachis short or none; ligule free, erect, concave; petiole slender, biconvex, smooth on the margins; sheath usually beautifully fringed: spadices long; axis clothed with tubular sheaths; papery-coriaceous, split: fls. on rather long, slender pedicels, the pedicel with a caducous bract at the base: fr. the size of a pea. For the new Porto Rican species, see Cook, Bull. Torr. Bot. Club, Oct., 1901.



2499. A good specimen of Thrinax.

One of the best groups of palms for pot-culture. The species are of slow growth, but succeed with indifferent care. They are mostly of elegant form and habit. A good specimen is shown in Fig. 2499.

For *T. Chuco*, see *Acanthoriza Chuco.*

A. *Under surface of leaves green.*
B. *Ligule with a blunt appendage at the middle* ....1. **radiata**
BB. *Ligule bluntly deltoid*............2. **parviflora**
BBB. *Ligule obsolete, truncate* ....3. **Barbadensis**
AA. *Under surface of leaves silvery or glaucous.*
B. *Leaf-segments connivent at base* ..4. **argentea**
BB. *Leaf-segments connivent for one-third their length* ....5. **excelsa**
BBB. *Leaf-segments connivent for one-half their length*................6. **multiflora**

1. **radiàta,** Lodd. (*T. élegans*, Hort.). Caudex short: lvs. green, glabrous or slightly puberulent beneath; segments united to or beyond one-third; ligule broadly rounded, with a short, blunt appendage at the middle. Cuba to Trinidad.

2. **parviflòra,** Swz. Caudex 10–20 ft. tall: lvs. 10–25 in. long, minutely pubescent, becoming glabrous, green beneath; segments united one-fourth or one-sixth their length; ligule bluntly deltoid, 1½ lines long. Bahamas, Jamaica. Florida. S.S. 10:510.

3. **Barbadénsis,** Lodd. Trunk middle-sized: lvs. green, glabrous; segments united at the base: ligule obsolete, truncate: spadix paniculate: berry polished, ⅓ in. thick. Barbadoes.

4. **argéntea,** Lodd. Caudex 12–15 ft. high, 2–3 in. thick: lvs. shorter than the petiole, silvery gray beneath; segments united at the base; ligule concave, semilunar, erose. West Indies.

5. **excélsa,** Lodd. Lvs. pale green above, hoary-glaucous beneath; segments united one-third; ligule bluntly deltoid; sheath densely buff-lanate. Jamaica, British Guiana.

6. **multiflòra,** Mart. (*T. graminifòlia*, Hort.). Stem medium, 6–8 ft. high; sheaths ragged, fibrous, irregularly reticulate, tomentose: young lvs. white woolly-tomentose; blade equaling the petiole, laciniate; segments united one-half their length, ensiform-acuminate, rather strict, glaucous beneath; ligule transversely oblong, sinuate, 3-lobed. Haiti. I.H. 31:542.

T. crinìta, Griseb. & Wendl. Cuban. No description available. Only one plant known. Cult. by W. C. Wilson, of Astoria, N. Y. *T. elegantissima*, Hort., seems to be unknown to botanists. —*T. Mórrissii*, Wendl. A native of Anguilla, grows 1–2½ ft. high, and has lvs. which are glaucescent beneath. Segments free for about two-thirds or three-fourths their length. Lately offered in Fla. G.C. III. 11:113.

JARED G. SMITH.

THRYPTÓMENE (Greek word said to refer to the low heath-like appearance of the plant). *Myrtàceæ.* About 18 species of heath-like shrubs from Australia, with small, opposite leaves and small or minute flowers, which are solitary in the axils or fascicled.

Mitchelliàna, F. Muell. A compact, bushy shrub with slender branches: lvs. oblong, flat, ¼–½ in. long: fls. in the upper axils solitary or in clusters of 2 or 3, white. Offered in southern Calif. Introduced by Mrs. T. B. Shepherd, who says the plant rarely exceeds 4 ft. in height, blooms in midwinter and is good for cut-flowers.

F. W. BARCLAY.

THÙJA. See *Thuya.*

THUJÓPSIS. See *Thuyopsis.*

THUNBÉRGIA (after Karl Peter Thunberg, professor of botany at Upsala and successor to Rudbeck and Linnæus; died 1828). *Acanthàceæ.* Mostly tall perennial greenhouse climbers producing flowers in great profusion: lvs. opposite: fls. blue, yellow, purple or white, olitary and axillary or in racemes; calyx annular and carcely lobed or toothed or 10–15-toothed, surrounded by 2 large bracts which often inclose also the corolla-tube; corolla trumpet-shaped, with a spreading limb, tube curved or oblique, often compressed, enlarged toward the mouth; stamens 4, didynamous, fixed near the base of the tube, filaments thickened at the base, separate; anther-cells parallel, equal, mostly mucronate at the base: ovary seated on a fleshy disk, 2-loculed, each cell with 2 ovules (rarely only one). The Thunbergieæ are distinguished by the contorted corolla, the 4-seeded capsule, and the globose seeds.

2500. Thunbergia alata (× ⅓).

The Thunbergias are nearly all vigorous greenhouse climbers resembling allamandas in habit. In large conservatories where they are not cramped for room they flower freely and display their flowers to the best advantage. Severe pruning, which is necessary in small greenhouses, prevents the production of flowers. The larger species, *T. laurifolia*, *T. affinis*, *T. grandiflora*, *T. Mysorensis*, and *T. coccinea* are rapid growers, requiring plenty of feeding and root-room. All do better in open beds than in pots. They may be propagated either from seeds or by cuttings which are taken from the young wood which starts into growth after the plants have been cut back during winter. These produce few flowers the following autumn, but bloom freely the second season. As a rule, the plants flower in late summer or autumn, but this may be made to vary according to treatment in some species. *T. alata* and its varieties and *T. fragrans* are often treated as annual garden plants, flowering in late summer. *T. erecta* and *T. affinis* when grown in pots form rather compact shrubby plants. See Gn. 24, p. 314; 30, p. 292; 47, p. 150. *T. elegans* of the trade cannot be accounted for by the writer. HEINRICH HASSELBRING.

Thunbergias and allamandas are great favorites in central and southern Florida, being used on verandas, arbors, small trees, old stumps, trellises and buildings. Of the blue-fld. kinds *T. grandiflora* is hardiest and commonest. It has large, heart-shaped leaves which overlap one another in a charming manner. It blooms from September till Christmas, the fls. being light blue and rather dull as compared with the next. The form of *T. laurifolia*, known to the trade as *T. Harrisii*, has nearly sky-blue fls., of a deeper but brighter hue than the preceding. It is a taller-growing and choicer plant, and has 10 or more fls. in a raceme, while those of *T. grandiflora* are solitary in the axils. *T. fragrans* is the common white-fld. kind. The form cult. in Florida is probably var. *vestita*, as the blossoms are not fragrant.

T. alata is a general favorite. The fls. range from buff and white to orange with a deep purplish brown throat, the last form being the most popular. This species is killed to the ground by sharp frost every winter but sprouts vigorously the following spring. It also comes up from self-sown seed. This species grows only 7 or 8 ft. high. All the Thunbergias mentioned above are easily raised from cuttings or layers in summer. *T. erecta* is not a climber but has a somewhat straggling habit. It has small, dark green lvs. and large, deep purplish blue gloxinia-like fls. which are white at the base. There is a pure white variety of it. It blooms all summer and autumn. It is readily raised from cuttings during the rainy season. H. NEHRLING.

INDEX.

affinis, 1.
alata, 2.
alba, 2, 4.
albiflora, 2.
aurantiaca, 7.
Backerii, 2.
Bakeri, 2.
chrysops, 5.
coccinea, 9.
cærulea, 4.
Doddsii, 2.
erecta, 4.
fragrans, 3.
Fryeri, 2.
grandiflora, 6, 7.
Harrisii, 7.
intus-alba, 2.
laurifolia, 7.
lutea, 2.
Mysorensis, 8.
sulphurea, 2.
unicolor, 2.

A. *Fls. axillary, solitary.*
B. *Lvs. entire*........................1. **affinis**
BB. *Lvs. angularly toothed.*
C. *Petioles winged*..................2. **alata**
CC. *Petioles not winged.*
D. *Color of fls. white: corolla-lobes truncate and sinuately toothed at the apex*..........3. **fragrans**
DD. *Color of fls. blue (white only in varieties).*
E. *Plant suberect*..............4. **erecta**
EE. *Plant climbing.*
F. *Throat of the corolla yellow*.5. **chrysops**
FF. *Throat of the corolla white*.6. **grandiflora**
AA. *Fls. in terminal or axillary racemes* (see, also, *T. grandiflora*).
B. *Color of fls. blue*..................7. **laurifolia**
BB. *Color of fls. yellow*................8. **Mysorensis**
BBB. *Color of fls. scarlet*................9. **coccinea**

1. **affinis**, S. Moore. A rambling shrub, 10–12 ft. high, smooth: branches 4-angled: lvs. short-petioled, elliptic, acute, entire: fls. 2 in. across, deep purple-blue, with a yellow throat. Summer. Tropical Africa. B.M. 6975. G.C. III. 2:461. G.M. 32:291.—This plant is closely allied to *T. erecta*, from which it differs by its entire lvs. and larger fls., which are about twice the size of those of *T. erecta*. When grown in a pot the plant forms a compact shrub, but when given more room it is a rambling climber.

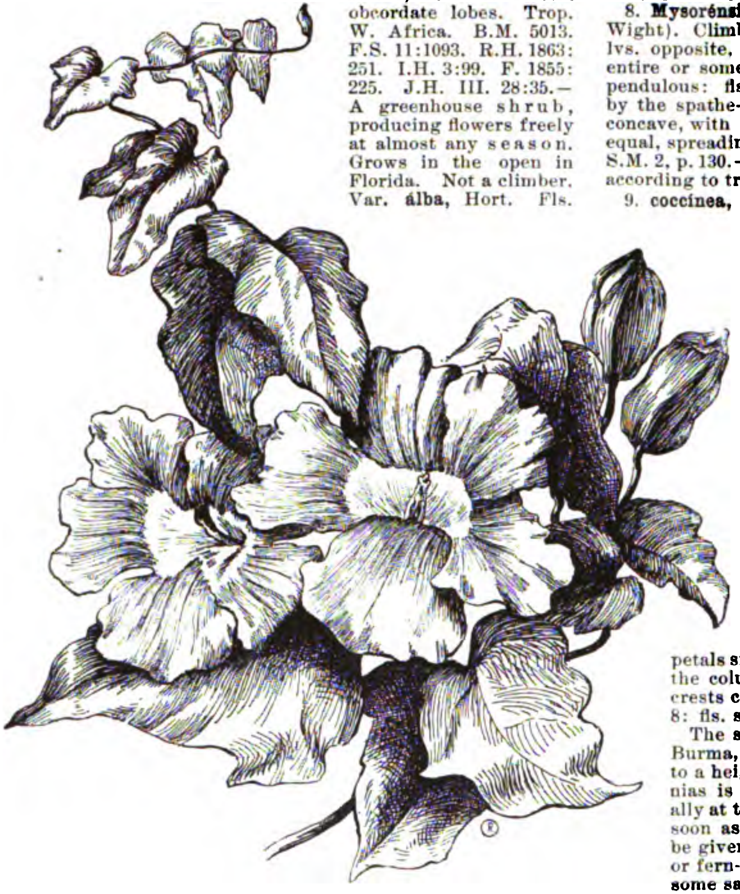
2. **aláta**, Boj. Fig. 2500. Stem square, climbing-hairy: lvs. opposite, triangular-ovate, hastate, repand-toothed, rough-pubescent, tomentose beneath; petioles winged, about as long as the lvs.: fls. solitary, on axillary peduncles; calyx very small, surrounded by 2 large inflated bracts; corolla-tube somewhat longer than the involucre, dark purple within; limb rotate, oblique, of 5 rounded segments, buff or cream-colored. S.E. Africa. B.M. 2591. P.M. 2:2. B. 5:238 (not good). L.B.C. 11:1045.—A perennial climber which may also be treated as an annual greenhouse plant. Usually propagated by seeds. It is used either as greenhouse climber or to grow on trellises outdoors. Outside it flowers mostly in August, but by propagating at various times they may be had in blossom nearly the whole year in the greenhouse. There are many varieties, some of which have been described as species.

Var. **álba**, Paxt. (*T. aláta*, var. *albiflòra*, Hook.). Fls. white, with a blackish center. P.M. 3:28. B.M. 3512. Var. **aurantìaca**, Ktze. (*T. aurantìaca*, Paxt.). Fls. bright orange, with a dark center. The best of the group. P.M. 6:269. Subvar. **Dóddsii** has variegated lvs. P.M. 15:221. F.S. 4:415. Var. **Bàkeri**, Hort. (*T. Bakeri* or *Backerii*, Hort.). Fls. pure white. Var. **Frỳeri**, Hort. (*T. Frỳeri*, Hort. *T. alata*, var. *intus-alba*, Hort.). Pale orange, with a white center. Var. **sulphùrea**, Hort. Fls. sulfur-yellow. Var. **lùtea**, Hort. (*T. aláta*, var. *ùnicolor*, Hort.). Fls. entirely yellow.

3. **fràgrans**, Roxb. Stem slender, climbing: lvs. lanceolate to triangular-ovate, cordate or subcordate, mostly angularly toothed on each side of the base, rough on both sides, petiolate: fls. white, axillary; corolla-tube narrow; limb spreading, 1⅓ in. across, lobes truncate and repandly toothed at the end. Summer. India.

Var. **lævis,** Clarke, is glabrous. B.M. 1881. L.B.C. 20:1913. Var. **vestita,** Clarke, is more hairy and the flowers are not fragrant.

4. **erécta,** T. Anders. (*Meyènia erécta,* Benth.). Shrub, 2–4 ft. high, with loose spreading branches, half-erect: lvs. opposite, petiolate, ovate or subrhomboid, smooth, entire or sinuate-toothed: fls. solitary on axillary peduncles; calyx cut into 12–14 short teeth, concealed by the large bracts; corolla funnelform; tube curved, deep yellow within; limb purple, 1½–2 in. across, of 5 subrotund obcordate lobes. Trop. W. Africa. B.M. 5013. F.S. 11:1093. R.H. 1863: 251. I.H. 3:99. F. 1855: 225. J.H. III. 28:35.—A greenhouse shrub, producing flowers freely at almost any season. Grows in the open in Florida. Not a climber. Var. **álba,** Hort. Fls. white. Var. **cærùlea,** Hort. Fls. large, intense violet, with orange throat.



2501. Thunbergia grandiflora (× ⅔).

5. **chrysops,** Hook. Stem climbing, slightly hairy: lvs. opposite, petiolate, ovate-cordate, angularly toothed: peduncles axillary, solitary, 1-fld.: corolla funnelform or campanulate; tube yellow, limb purple, bluish around the throat. Sierra Leone. B.M. 4119. F.S. 1:5. P.M. 11:221. F. 1844:193.—Naturally a climber, but said to become somewhat erect if grown in a coolhouse.

6. **grandiflòra,** Roxb. Fig. 2501. Stem tall, climbing: lvs. broadly ovate, angularly cordate and toothed or lobed, somewhat roughened on both sides, petiolate: fls. solitary or in short, stout racemes in the leaf-axils, bright blue, becoming whitish in the throat; corolla-tube bell-shaped; limb 3 in. across, of 5 large, spreading rounded lobes. Bengal. B.M. 2366. P.M. 7:221. L.B.C. 4:324. B. 2:76. B.R. 6:495. Gn. 47:1003. I.H. 42:32. G.C. III. 9:789.—A very large perennial greenhouse climber; flowers during the summer or autumn. There is also a white-flowered variety.

7. **laurifòlia,** Lindl. (*T. Hárrisii,* Hook. *T. grandiflòra,* Wall.). Stem terete, smooth except the youngest, twining: lvs. long-petiolate, ovate-oblong to oblong-lanceolate, acuminate, rounded at the base, smooth, entire or slightly toothed: fls. 3 in. across, pale blue, white or yellow in the throat, borne in axillary whorls or in a raceme in which they are also clustered or whorled; corolla with a wide, oblique trumpet-shaped tube and a large 5-lobed limb. India. B.M. 4985; 4998. F.S. 12:1275. Gn. 12, p. 420; 30:563 and p. 293. R.H. 1860, p. 342. J.H. III. 28:345. Gng. 3:295.—Perennial greenhouse climber, flowering profusely in winter. Propagated by cuttings.

8. **Mysorénsis,** T. Anders. (*Hexacéntris Mysorénsis,* Wight). Climbing shrub, with long, slender branches: lvs. opposite, petiolate, oblong-lanceolate, acuminate, entire or somewhat distantly toothed: racemes long, pendulous: fls. yellow, 2 in. across, the tube enclosed by the spathe-like bracts; limb 4-lobed, the upper lip concave, with reflexed side lobes, lower lip of 3 subequal, spreading lobes. India. B.M. 4786. F.S. 8:752. S.M. 2, p. 130.—A tall greenhouse climber which flowers, according to treatment, at all seasons.

9. **coccínea,** Wall. (*Hexacéntris coccínea,* Nees). A very tall climber: stem much branched, 4-angled: lvs. short-petiolate, variously shaped, the lower broadly ovate, with a hastate or cordate angled base, the upper ovate, cordate, all angularly toothed or the upper entire: fls in terminal or axillary racemes, 1–3 ft. long; bracts large, inflated, as long as the tube; limb scarlet, of 5 reflexed emarginate lobes; throat orange. Autumn and winter. India. B.M. 5124. L B.C. 12:1195. F.S. 23:2447. R.H. 1890, p. 197.

Heinrich Hasselbring.

THÙNIA (Count Thun-Tetschen, who had an important collection of orchids about the middle of the 19th century). *Orchidàceæ.* A small genus of which at present only 5 species are known. These are tall plants with annual leafy stems terminating in a raceme of showy flowers. The genus was formerly united with Phaius, from which it differs by the terminal inflorescence. Sepals and petals similar, spreading; labellum convolute over the column, spurred, ornamented with several crests consisting of lines of fleshy hairs: pollinia 8: fls. subtended by large membranous bracts.

The species of Thunia occur in northern India, Burma, and in the S. Himalaya region ascending to a height of 6,000 ft. The culture of the Thunias is very simple. They begin growth naturally at the end of February or early in March. As soon as new growth is visible the plants should be given new material, consisting of fibrous peat or fern-root and sphagnum mixed with loam and some sand and potsherds for drainage. In their native home the plants are said to be epiphytic, and when treated as terrestrial orchids their native habit may be imitated by setting them well above the pot, which should not be too large. For the first 4–6 weeks until the young roots have made good growth, it is necessary to apply water sparingly. Thunias are very rapid-growing orchids and may be liberally supplied with liquid manure until the end of the flowering season, which occurs about the middle of August. Soon after this the leaves fall. The old stems winter in this condition and serve as food reservoirs for the young growth of the next season, but although they remain on the plant two years they form no leaves the second season. During the resting period they should be kept in a rather dry atmosphere and be given only enough water to prevent the stems (pseudobulbs) from shriveling. This is one of the few orchids which can be profitably propagated by cutting the old stems into lengths of about 6 in. and rooting them in sand or sphagnum. When rooted the young plants may be potted in the usual way. A temperature of 60°–65° is favorable during the growing season.

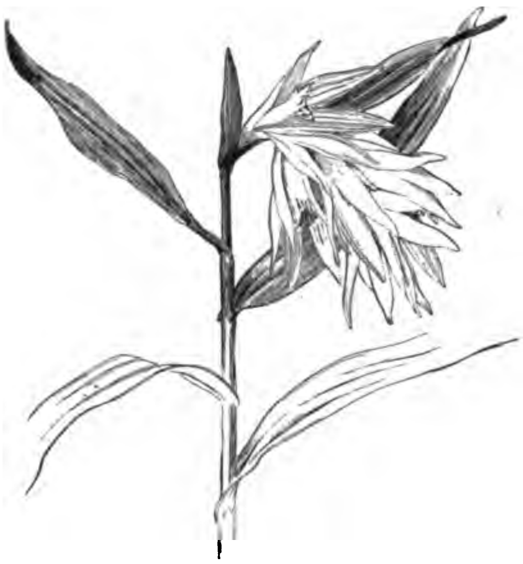
álba, Reichb. f. (*Phàius álbus,* Lindl.). Fig. 2502. Suberect, 2–3 ft., clothed with sheathing, oblong-lanceolate, striate lvs. 6 in. long: raceme drooping at the end of the stem, 6–12-fld.: fls. white, 3–4 in. across when fully open; sepals and petals oblong-lanceolate, acuminate; labellum shorter than the segments, not manifestly 3-lobed, lateral lobes convolute over the column, apex spreading, wavy and finely crisp. The color of the labellum is white veined with purple in the throat, with 5–9 purple or yellow fringed keels. Wings of the column entire. April–Aug. Burma and S. Himalaya region. B.M. 3991. B.R. 24:33. P.M. 5:125. F.C. 3:125. R.H. 1874:450. Gt. 47, p. 233.—There are several varieties of this species. The throat of the labellum is often yellow.

Bénsoniæ, Hook. (*Phàius Bénsoniæ*, Benth.). Stems fascicled, 1–2 ft. high, leafy: lvs. linear-lanceolate, 8–10 in. long: fls. like those of *T. alba* but of a pale purple color; labellum large, 3-lobed, deep purple in front, with a yellow crested disk, with 6–7 rows of fringe-like golden yellow hairs; spur short, slender. India. July–Sept. B.M. 5694. G.M. 31:557.—The most showy species of the genus.

Marshalliàna, Reichb. f. (*Phàius Márshalliæ*, Nichols.). Closely related to *T. alba*. Stems somewhat stronger: segments pure white, acuminate: labellum evidently 3-lobed, with the lateral lobes surrounding the column, middle lobe wavy and crisp. The color of the labellum is yellowish white, with five orange-fringed keels in the throat: wings of the column toothed. May–Aug. India. R.B. 21:229. Gt. 47, p. 233. S.H. 2, p. 335.—A var. **ionophlèbia,** Reichb. f., has the center of the labellum bright yellow, paler toward the margin.

HEINRICH HASSELBRING.

THURBER, GEORGE (Plate XLI), botanist, naturalist and editor, was born in Providence, R. I., September 2, 1821, and died at his home near Passaic, N. J., April 2, 1890. He obtained his early education at the Union Classical and Engineering School of his native city. Afterwards he served an apprenticeship as pharmacist, at the termination of which he began business for himself in partnership with Joshua Chapin. During these years he devoted himself eagerly to the study of chemistry and natural sciences in general, but especially to botany, so that at an early age he was already well known as one of the most prominent botanists of the country. This brought him in close intimacy with Drs. John Torrey, Asa Gray, George Engelmann, Louis Agassiz and other eminent scientists, whose warm friendship he enjoyed until his death. In 1850 he obtained the appointment as botanist, quartermaster and commissary of the United States Boundary Commission for the survey of the boundary between the United States and Mexico. During the following four years his botanical work consisted mainly in the exploration of the native flora of these hitherto unknown border regions. His herbarium collected there comprised a large number of species new to scientists, some of which have been named after their discoverer, *Cereus Thurberi* being one of the most important; it is now cultivated for its fruit in the desert regions of North Africa. This historical herbarium formed the subject of Dr. Asa Gray's important work "Plantæ Novæ Thurberinanæ," published by the Smithsonian Institute. After his return to New York in 1853, Dr. Thurber received an appointment to the United States Assay Office, of which Dr. John Torrey was the assayer. In this position he remained until 1856, when owing to his strong sympathies with Gen. John C. Fremont, who was the first presidential candidate of the Republican party, he preferred to resign rather than sacrifice his principles. This incident well illustrates his perfect candor and characteristic, uncompromising spirit. Upon being asked for a contribution to the Buchanan campaign fund, he inquired: "Is this an invitation or a demand?" He was informed that it was a demand, and at once tendered his resignation. During the following three years he was connected with the Cooper Union and the College of Pharmacy of New York city as lecturer on botany and materia medica. In 1859 he was appointed professor of botany and horticulture at the Michigan Agricultural College, which position he held for four years. Here his wide and varied knowledge, of which he had ready command, his alertness of brain, clearness and vigor of speech, humor and enthusiasm made him a successful and ideal teacher. Many of his students and those who studied under his students are now filling important professional and editorial chairs throughout the country. This position he resigned in 1863 to accept—on the urgent invitation of Orange Judd, the publisher—the editorship of the "American Agriculturist," which he held to within a few years of his death, when failing health prevented him from continuing his ardent labors. In this position he found his most congenial work and the real mission of his life, for which his previous training, his vast and varied knowledge of natural sciences, arts and industries, his quick perception and rare judgment as to cause and effect had fitted him so admirably. Few men have exerted so powerful and effective an influence on progressive horticulture and agriculture as has Dr. Thurber. During his connection with the "American Agriculturist" he was a most painstaking and scrupulous editor and would not accept any article or statement about the correctness and accuracy of which he was not fully convinced. In order to convince himself to his own satisfaction of the value of new plants, fruits and vegetables, he established an extensive experimental and botanical garden in connection with his home on the Passaic river, which he named "The Pines," after a clump of tall white pines growing in front of it. The results of these observations and experiments formed the basis of a regular and valuable series of "Notes from the Pines." But in no part of his editorial work has he taken so much delight as in the "Doctor's Talks," and thousands of now gray-haired men and women will long hold in grateful and affectionate remembrance "The Doctor," who through his letters to the "boys and girls" has added so much to the delights of their childhood days. Although Dr. Thurber was never married and had no children, he was always fond of young people and was never happier than when he could teach and assist them in whatever lay in his power. The amount of his writings in the "American Agriculturist" during the twenty-two years of his connection with it was enormous, but as his name but rarely appeared with his articles it would be impossible to estimate the aggregate, yet whatever he wrote bore the stamp of accuracy of detail and naturalness of style. While in Michigan he revised and partly rewrote Darlington's "Agricultural Botany," which was published under the title of "American Weeds and Useful Plants." He wrote also the entire botany of Appleton's "New American Encyclopedia." An important part of



2502. Thunia alba. (× ¼)

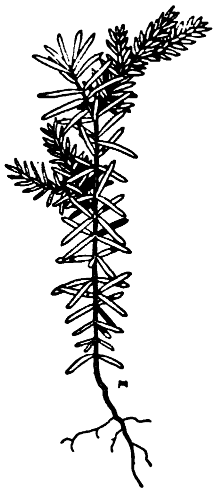
his contributions to horticultural literature consisted in editing, revising and bringing out the horticultural and agricultural books of the Orange Judd Company. After the death of Dr. Torrey, he was elected president of the Torrey Botanical Club. He was also president of the New Jersey Horticultural Society; vice-president of the American Pomological Society for New Jersey; and honorary member of many scientific societies throughout the world. The honorary title of doctor of medicine was conferred upon him by the University Medical College of New York. During the latter years of his life he suffered severely from chronic rheumatism, which finally resulted in heart degeneration and his death. Personally, Dr. Thurber was one of the most genial of men, gentle, sweet-tempered, with a considerable share of good-natured humor, always ready to help those whom he felt needed assistance, liberal-minded and generous to a fault; but a relentless foe to frauds, shams and impostors of every kind.

2503. Typical form of Thuya occidentalis (× ½).

F. M. Hexamer.

THUYA (Thya or Thyia, an ancient Greek name for a resinous tree or shrub). Also spelled *Thuja* or *Thuia*. Including *Biota*. *Coniferæ*. Arborvitæ. Ornamental evergreen trees of narrow pyramidal habit, with much ramified branches, the branchlets arranged frond-like, flattened and clothed with small scale-like leaves; the fruit is a small strobile or cone not exceeding 1 in. in length. The well-known *T. occidentalis* is hardy north and also *T. Japonica*. *T. gigantea* and several forms of *T. orientalis* are hardy as far north as Mass. Thuyas are favorites for formal gardens. They are all of regular, symmetric[illegible] Their numerous garden forms vary greatly in [illegible]nd in color of foliage. For planting as sin[illegible]ns in parks they are mostly too stiff and [illegible] they are well suited for massing on border[illegible]eams or lakes. The most beautiful and the most [illegible] growing species is *T. gigantea*. Thuyas are well adapted for hedges and wind-breaks. They bear pruning well and soon form a dense hedge. They thrive best in somewhat moist, loamy soil and are easily transplanted. Prop. by seeds sown in spring. The varieties, especially those of *T. occidentalis*, are usually prop. by cuttings taken late in summer and kept during the winter in a cool greenhouse or frame; also by grafting on seedling stock in summer or early in spring in the greenhouse. The vars. of *T. gigantea* and *T. orientalis* are usually grafted, since they do not grow readily from cuttings, except the juvenile forms of the latter, as var. *decussata* and *Meldensis*. Consult *Retinispora*.

Five species occur in N. America, E. and Cent. Asia. Resiniferous trees with short horizontal, much ramified branches; the branchlets flattened and frond-like arranged: lvs. decussate, scale-like, appressed, usually glandular on the back: fls. monœcious, globose, small, terminal on short branchlets, staminate yellow, consisting of usually 6 opposite stamens, each with 2–4 anther-cells; pistillate consisting of 8–12 scales in opposite pairs, of which only the middle ones, or in the section Biota the lower ones, are fertile, each scale with 2 ovules inside at the base: strobiles globose-ovate to oval-oblong, with 2 seeds under the fertile scales. The wood is light and soft, brittle and rather coarse-grained, durable in the soil; it is much used for construction, cabinet-making and in cooperage. *T. occidentalis* contains a volatile oil and thujin and is sometimes used medicinally.



2504. Seedling of Thuya occidentalis (× ⅓).

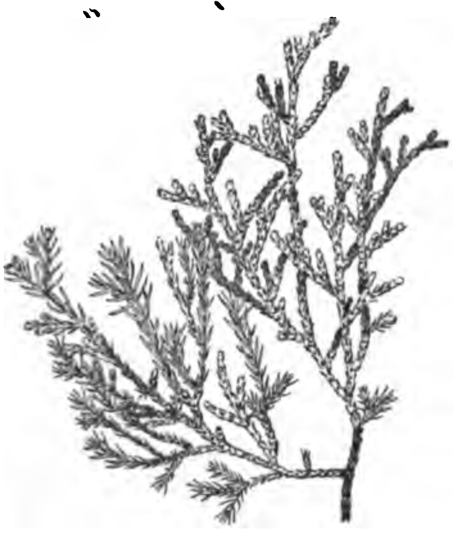
A. *Cones pendulous, with thin scales, apiculate below the apex: seeds winged, compressed: branchlets ramified more or less horizontally, with a distinct upper and under side.*

B. *Lvs. yellowish or bluish green beneath: usually 2 pairs of fertile scales.*

occidentàlis, Linn. Common Arborvitæ. Erroneously but commonly called White Cedar (which is properly Chamæcyparis). Figs. 2503–5. Tree, attaining 60 ft. and more, with short horizontal branches ascending at the end and forming a narrow pyramidal, rather compact head: lvs ovate, acute, usually glandular, bright green above, yellowish green beneath, changing in winter usually to dull brownish green: cones oval to oval-oblong, about ½ in. long, brownish yellow: seeds ⅛ in. long. New Brunswick to Manitoba, south to N. C. and Ill. S.S. 10:532.—Much used for telegraph poles. A great number of garden forms, about 50, are in cultivation. The best known are the following: Var. **álba**, Nichols. (var. *albo-spica*, Beissn. Var. *Queen Victoria*, Hort.). Tips of young branchlets white. Var. **argéntea**, Carr. (var. *albo-variegàta*, Beissn.). Branchlets variegated silvery white. Var. **aùrea**, Nichols. Broad bushy form, with deep yellow foliage; also var. **Búrrowii**, Douglas' Golden and Meehan's Golden are forms with yellow foliage. See also var. *lutea*. Var. **aureo-variegàta**, Beissn. (var. *aùrea maculàta*, Hort.). Foliage variegated with golden yellow. Var. **cónica dénsa**, Hort. "Dense conical form." Var. **Colúmbia**, Hort. "Strong habit; foliage broad, with a beautiful silvery variegation." Var. **cristàta**, Carr. Irregular dwarf, pyramidal form with stout crowded, often recurved branchlets. Var. **Doùglasii**, Rehder. Bushy form, with

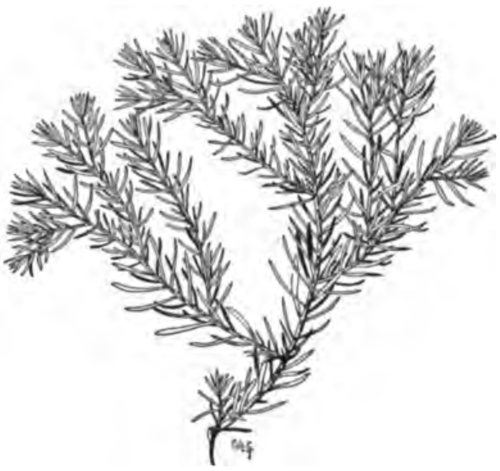
2505. The Arborvitæ—Thuya occidentalis. Nearly full size.

long and slender sparingly ramified branches nodding at the tips, partly 4-angled and clothed with sharply pointed leaves. A very distinct form, somewhat similar to *Chamæcyparis pisifera*, var. *filifera*. Var. **dumòsa,** Hort. (var. *plicàta dumòsa*, Gord.). Dwarf and dense form of somewhat irregular habit; in foliage similar to var. plicata. Var. **Ellwangeriàna,** Beissn. (var. Tom Thumb). Fig. 2506. A low, broad pyramid, with slender branches clothed with two kinds of foliage, adult lvs. and primordial, acicular spreading lvs.; it is an intermediate form between the var. ericoides and the type. R.H. 1869, p. 350; 1880, p. 93. Var. **Ellwangeriàna aùrea,** Späth. Like the preceding but with yellow foliage. Var. **ericoides,** Beissn. & Hochst. (*Retinispora dùbia*, Carr. *R. ericoìdes*, Hort., not Zucc.). Fig. 2507. Dwarf, globose or broadly pyramidal form, with slender branchlets clothed with needle-shaped, soft, spreading lvs., dull green above, grayish green beneath and assuming a brownish tint in winter. R.H. 1880, p. 93, 94. A juvenile form. See, also, *Retinispora*. Var. **globòsa,** Beissn. (var. *globulàris*, Hort. Var. *compácta globòsa*, Hort. Var. *Fróebeli*, Hort.). Dwarf globose form, with slender branches and bright green foliage. Var. **Hárrisoni,** Hort. "A neat little tree with the entire foliage tipped almost pure white." Var. **Hóveyi,** Veitch. Dwarf, dense, ovate-globose form with bright green foliage. Var. **intermèdia,** Hort. "Of dwarf, compact habit." Var. **Little Gem,** Hort. Very dwarf, dark green form, growing broader than high. Var. **lùtea,** Veitch. (var. *elegantíssima*, Hort. Var. George Peabody's Golden). Pyramidal form, with bright yellow foliage. Var. **nàna,** Carr. (*T. plicàta*, var. *compácta*, Beissn.). Dwarf, compact globose form; foliage similar to var. plicata. Var. **péndula,** Gord. With the branches bending downward and the branchlets more tufted. Var. **plicàta,** Mast. (*T. plicàta*, Parl., not Don. *T. Wareàna*, Booth). Pyramidal tree, darker and denser than the type: branchlets short, rigid, much flattened: foliage distinctly glandular, brownish dark green above, bluish green beneath. G.C. III. 21:258. Said to have been introduced from N. W. America, but not found wild there. Var. **pùmila,** Beissn. Dwarf, dense form with dark green foliage. Var. **pygmæa,** Hort. (*T. plicàta*, var. *pygmæa*, Beissn.). Similar to var. *dumosa*, but still dwarfer, with bluish green foliage. Var. **Rèidii,** Hort. "Broad, dwarf form with small lvs., well retaining its color during the winter." Var. **Spæthii,** P. Smith. Peculiar form with two kinds of foliage; the younger and lower branchlets with spreading acicular lvs. like those of var. *ericoides*, but thicker in texture; the upper branchlets slender and sparingly ramified much like those of var. *Douglasi*.



2506. Thuya occidentalis, var. Ellwangeriana (× ½).

Gt. 42, p. 539. Var. **Vervæneàna,** Henk. & Hochst. Of smaller and denser habit than the type: branchlets slenderer, with yellowish foliage, bronzy in winter. Var. **Wagneriàna,** Beissn. (var. *Vérsmanni*, Hort.). Globose form, retaining its bright green color during the winter. M.D.G. 1895:123. Var. **Wareàna,** Beissn. (var. *robústa*, Carr. *T. Caucásica*, *Tatárica* and *Sibírica*, Hort.). Pyramidal tree, lower and denser than the type, with stouter branchlets; foliage bright green. Very desirable form. Var. **Woodwardii,** Hort. "Dense, globose form, with deep green foliage."



2507. Thuya occidentalis, var. ericoides (× ½).

BB. *Lvs. with whitish markings beneath.*

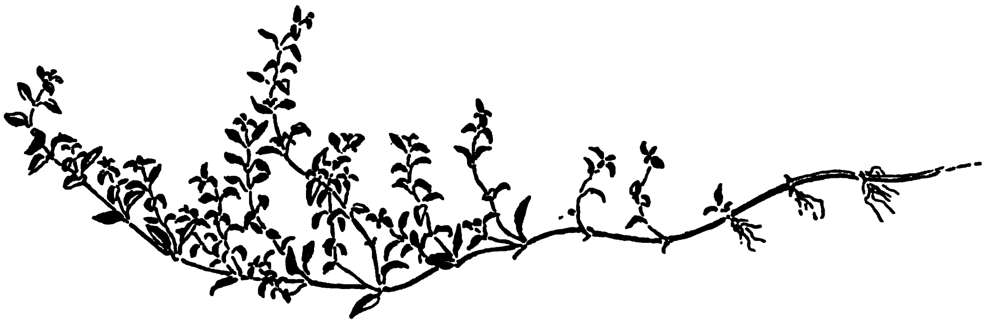
gigantèa, Nutt. (*T. plicàta*, Don. *T. Ménziesii*, Dougl. *T. Lobbi*, Hort.). Tall tree, attaining 200 ft., with short horizontal branches often pendulous at the ends, forming a narrow pyramid: trunk with a much buttressed base and clothed with cinnamon-red bark: branchlets slender, regularly and closely set: lvs. bright green and glossy above, dark green beneath and with whitish triangular spots: lvs. of vigorous shoots ovate, acuminate, glandular, of the lateral branchlets acute and scarcely glandular: cones cylindric-ovoid, little over ½ in. long; scales 8–10, elliptic-oblong, usually the 3 middle pairs fertile; seeds winged, notched at the apex. Alaska to northern Calif. and Mont. S.S. 10:533. G.C. III. 21:215. G.F. 4:116. Var. **aùrea,** Beissn. With yellowish foliage. Var. **grácilis,** Beissn. Smaller tree, with more slender branches and smaller foliage of paler green.

Japónica, Maxim. (*T. Stándishii*, Carr. *T. gigantèa*, var. *Japónica*, Franch. & Sav. *Thuyópsis Stándishi*, Gord.). Similar to the preceding but lower, usually only 20–30 ft. high: branchlets more irregularly set, thicker and less compressed: lvs. ovate, obtusish, thickish, lighter green above, darker beneath and with whitish, triangular spots: cones oval, little over ½ in. long: scales 8, oval, usually the two middle pairs fertile. Japan. G.C. III. 21:258. R.H. 1896:160.

AA. *Cones upright, the thickened scales with a prominent horn-like process below the apex: seeds wingless: branchlets ramified in a vertical plane with both sides alike.* (*Biota.*)

orientàlis, Linn. (*Biòta orientàlis*, Endl.). Pyramidal or bushy tree, attaining 25 ft., with spreading and ascending branches: branchlets thin: lvs. rhombic-ovate, acute, bright green, with a small gland on the back: cones globose-ovate, ½–1 in. long; usually 6 ovate scales, each with a horn-like process, the uppermost pair sterile. From Persia to E. Asia, in Japan probably only cult. There are many garden forms, of which the following are the best known: Var. **athrotaxoides,** Carr. Dwarf, irregularly and not frond-like branching; branchlets nearly quadrangular, slender, dark green. R.H. 1861, p. 230. Var. **aùrea,** Hort. Low, compact, globose shrub, golden yellow in spring, changing to bright green. Var. **aùrea conspícua**, Hort. More erect, the intense golden foliage partially suffused with green. Var. **aùrea nàna**, Hort. Golden yellow foliage and very dwarf and compact habit. Var. **aùreo-variegàta**, Hort. Of pyramidal habit: branchlets variegated with yellow. Var. **decussàta**, Beissn. & Hochst. (*Retinispora juniperoìdes*, Carr. *Chamæcýparis decussàta*, Hort.). Fig. 2094. Dwarf, globose form: lvs. linear-lanceolate, spreading, stiff, acute, bluish green. A juvenile form; see, also, *Retinispora*. Var. **elegantíssima**, Gord. Of low, columnar habit, bright yellow in spring, yellowish green afterwards. Var. **falcàta**, Lindl. Of dense, pyramidal growth, deep green, the horns of the strobiles curved backwards. Var. **filifórmis stricta**, Hort. Round-headed, dwarf bush, with upright, thread-like branches. Var. **grácilis**, Carr. Of pyramidal, somewhat loose and slender habit, with bright green foliage. Var. *freneloìdes* and var. *Nepalénsis* are hardly different from this. Var. **Meldénsis**, Veitch. Of columnar pyramidal, somewhat irregular growth: lvs. acicular, bluish green, sometimes passing into the normal form. Intermediate between the var. *decussata* and the type. Var. **péndula**, Parl. (var. *filifórmis*, Henk. & Hochst. *T. péndula*, Lamb. *T. filifórmis*, Lindl.). Branches pendulous, thread-like, sparingly ramified, and with the lvs. wide apart and acuminate. Var. *funiculàta*, Hort., and var. *intermèdia*, Carr., are intermediate forms between this var. and the type. Var. **pyramidàlis**, Endl. Of pyramidal habit, with bright green foliage; one of the tallest and hardiest vars. Var. **semperauréscens**, Veitch. Dwarf, globose; the golden hue of the foliage remains throughout the whole year. Var. **Sièboldi**, Endl. (var. *Japónica*, Sieb., var. *nàna*, Carr. var. *Zuccariniàna*, Veitch. Var. *compácta*, Beissn.). Globose, compact, low form, bright green.

Alfred Rehder.



2508. Creeping Thyme — Thymus Serpyllum (× ⅓).

THUYÓPSIS (Greek, *Thuya-like*). *Coniferæ*. Evergreen ornamental pyramidal tree or shrub, with spreading branches, the branchlets arranged in a frond-like fashion, much flattened and clothed with scale-like glossy green foliage. Thuyopsis is one of the most beautiful Japanese conifers, and is well adapted for planting as a single specimen on the lawn wherever it can be grown successfully. It is hardy as far north as Mass., but usually suffers from summer drought. It thrives best in a sheltered and shaded position and in moist loamy soil, and seems to grow to perfection only in cool and moist climates. Prop. by seeds, also by cuttings and by grafting like Thuya. Plants raised from cuttings usually grow into bushy, round-headed plants. Plants grafted on Thuya are said to be short-lived. Seedlings are therefore to be preferred. The genus contains only one Japanese species, closely allied to Thuya and chiefly distinguished by the 4–5 ovules under each scale. The yellowish white, close and straight-grained wood is very durable and is used in Japan in boat- and bridge-building.

dolobràta, Sieb. & Zucc. (*Thùya dolobràta*, Linn.). Pyramidal tree, attaining 50 ft. or sometimes shrubby: branchlets irregularly whorled or scattered, horizontally spreading and often nodding at the ends: branchlets one-fifth to one-fourth in. broad: lvs. glossy green above, marked with a broad white band beneath, those of the upper and under side obovate-oblong, obtuse, adnate except at the apex, the lateral ones spreading, ovate-lanceolate and curved (hatchet-shaped), obtusish: scales of staminate fls. 6–10, much thickened at the obtusely pointed apex, the middle ones fertile and with 3–5-winged seeds under each scale. Japan. S.Z. 2:119, 120. G.C. II. 18:556.—Var. **nàna**, Sieb. & Zucc. (*T. lætèvirens*, Lindl.). Dwarf form, with more slender and narrower branchlets of a lighter green. Var. **variegàta**, Fortune. Tips of branchlets creamy white.

T. boreàlis, Hort.=Chamæcyparis Nutkaensis.—*T. Stándishi*, Gord.=Thuja Japonica.

Alfred Rehder.

THYME. See *Thymus*.

THYME, WATER. See *Elodea*.

THÝMUS (classical name of doubtful origin, perhaps from the Greek for *incense*). *Labiàtæ*. Thyme. Probably about 50 species, although more have been described, all natives of the Old World and chiefly of the Mediterranean region. They are low, half-shrubby perennials, although usually herbaceous or nearly so in the North. Lvs. small, opposite, simple and mostly entire. The calyx is ovate or ovoid, hairy in the throat, 5-toothed and 2-lipped, about 10–13-nerved, usually declined in fruit: corolla small, 2-lipped, the upper lip 2-toothed and erect, the lower one 3-cleft and spreading: stamens 4, mostly in 2 pairs and usually exserted. The flowers are mostly in shades of blue or purple, but are sometimes white; they are borne in whorls, forming a terminal spike or head-like cluster. Thymes are erect or prostrate plants with strong mint-like odor. Most of the species are grown as a ground cover on banks, in borders or rockwork. The creeping or prostrate habit, ability to persist in dry places and poor soils, and the colored or woolly foliage of some species make them adaptable to a variety of uses. The common *T. Serpyllum* is evergreen. *T. vulgaris* is the Thyme of sweet herb gardens, being prized in cookery. All Thymes are easily propagated by means of division, although seedlings may sometimes be used to renew plantations of some of the species, particularly of *T. vulgaris*. Several names occur in American catalogues, all of which seem to be referable to three species, one of which is not a true Thymus. See *Sage*, where general culture of such herbs is given.

vulgàris, Linn. Common Thyme. Plant erect, the base sometimes decumbent, 1–2 ft., the branches stiff and woody, usually white-pubescent: lvs. sessile, linear to ovate-lanceolate, acute, the margins more or less revolute: fls. small, lilac or purplish, in terminal interrupted spikes. S. Eu.—An old garden plant, being grown as a sweet herb. The leaves and shoots are used for seasoning. It is well to renew the plants from seeds every two or three years. There are varieties with broad and narrow leaves.

Serpýllum, Linn. Fig. 2508. Mother of Thyme. Creeping Thyme. Creeping, wiry-stemmed, slightly pubescent: lvs. small, seldom ½ in. long, narrow-oblong to oval to nearly ovate, obtuse, narrowed into a distinct petiole, the margins sometimes slightly revolute: fls. minute, lilac, much shorter than the lvs., in axillary whorls. Temperate parts of Europe, Asia and N. Africa. —A common plant in old gardens, prized as an evergreen edging and as cover for rockwork and waste places; also run wild. The leaves are sometimes used for seasoning, as those of *T. vulgaris* are. The nodes are short, making it a very leafy plant. Variable. Some of the cult. forms are: var **citriodòrus**, Hort. (*T. citriodòrus*, Schreb.), the LEMON THYME, has small, strong-veined lvs. and a pronounced lemon odor. Var. **montànus**, Benth. (*T. montànus*, Waldst. & Kit. *T. Chamædrys*, Fries), has larger lvs. and longer, somewhat ascending branches. Var. **lanuginòsus**, Hort. (*T. lanuginòsus*, Schk.), is a form with small roundish lvs., and a pubescent-gray covering, making it a handsome plant for edgings. Var. **àureus**, Hort. Foliage golden, particularly in spring. Var. **argénteus**, Hort. Lvs. variegated with silvery white. Var. **variegàtus**, Hort. White-variegated lvs. Var. **coccíneus**, Hort. Fls. numerous, scarlet. There is a form with white fls. (see Gt. 45, p. 108). All forms are hardy.

Córsicus, Pers., is properly *Calamíntha Córsica*, Benth. Prostrate, small, glabrous or nearly so: lvs. very small, 2 lines or less long, nearly orbicular, petioled: fls. small, light purple, in whorls, the floral leaves similar to the others. Corsica.—A good little plant for edgings, with very aromatic herbage. L. H. B.

THYRSACÁNTHUS (Greek, *thyrse* and *flower*). *Acanthàceæ.* About 20 species of tropical American herbs or shrubs with opposite, often large leaves and red, tubular flowers in fascicles which are arranged in a terminal simple or panicled thyrse. Calyx short, 5-parted; corolla long-tubular, the limb 4-cut, slightly 2-lipped; stamens 2; staminodia 2, small, at the base of the filaments: capsule oblong; seeds 4 or fewer by abortion.

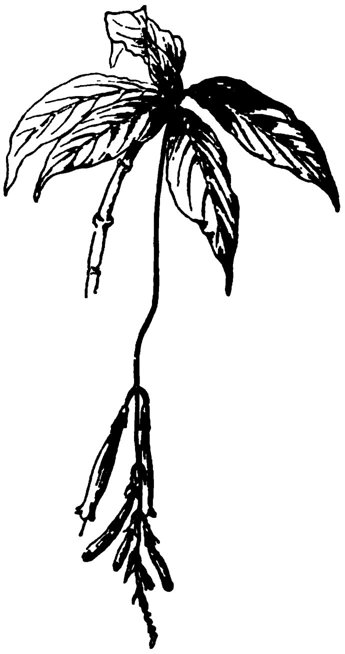
Schomburgkiànus, Nees (*T. rùtilans*, Planch.). Fig. 2509. A shrubby plant, becoming 6 ft. high: lvs. oblong-lanceolate, nearly sessile: racemes 8–10 in. or even 3 ft. long from the upper axils, slender, drooping: fls. tubular, red, about 1½ in. long, pendulous. Dec.–March. Colombia. B.M. 4851. R.H. 1852:160. Gn. 42, p. 482. F.S. 7:732. F. W. BARCLAY.

Thyrsacanthus Schomburgkianus is a fine old greenhouse favorite which has of recent years fallen into undeserved neglect. It deserves a place in every good general collection. It is chiefly admired for its umbrella-like habit and pendulous grace of its long sprays of slender, red, tubular flowers. Like many other acanthads, it becomes leggy and weedy in old plants, even if cut back severely. Hence, plants are rarely kept after the second season. The culture of Thyrsacanthus is easy. It is an ideal plant for a general collection, as it requires no special treatment. Some English writers advise a stove temperature, but the undersigned has grown it for many years in a coolhouse. Ordinary potting soil such as suits geraniums will do for Thyrsacanthus. It flowers about April and remains in bloom a long time. Cuttings may be made at any time in early spring and will produce flowering plants 2–2½ ft. high the first season. After flowering, they should be cut back severely. It is not desirable to have more than one plant in a pot, nor should the young plants be pinched the first season, as the umbrella form is preferable to that of a compact, much-branched bush. The pendulous habit of Thyrsacanthus has suggested to some gardeners the use of this plant for hanging baskets and brackets. ROBERT SHORE.

THYRSÓSTACHYS (Greek, *thyrse* and *spike*). *Gramineæ. T. Siamensis* is a tall Indian bamboo which has been offered in southern California since the article *Bamboo* was written for this work. As the plant is not included in Mitford's Bamboo Garden, its horticultural status is uncertain. Franceschi writes that the plant is rather tender at Santa Barbara. The genus belongs to a subtribe of bamboos of which Dendrocalamus is the type. This subtribe is distinguished by having 6 stamens, a 2-keeled palea and the pericarp free from the seed. For generic characters of Thyrsostachys, see the Flora of British India 7:397 (1897).

Thyrsostachys is a genus of 2 species of arborescent bamboos native to Upper Burma and Siam. The stem-sheaths are long, thin and persistent, with a long, narrow blade. The lvs. are small or moderate-sized. As nearly as may be judged from the only available description, this species could be inserted at the bottom of page 128 of this work, being distinguished from species 12 and 13 by the narrowness of the lvs.

Siaménsis, Gamble. A tender, deciduous, "giant bamboo," with very graceful tufted stems 25–30 ft. high and 1½–3 in. thick. Stem sheaths waved and truncate at the top, 9–11 x 4½–8 in.; auricles short-triangular: blade narrowly triangular: lvs. small, narrow, linear, 3–6 x ⅓–½ in. Siam. W. M.



2509. Thyrsacanthus Schomburgkianus (× ½).

TIARÉLLA (Latin, *a little tiara* or *turban;* in reference to the form of the pistil). *Saxifragàceæ.* FALSE MITREWORT. A genus of 6 species of slender perennial herbs, of which 4 are from North America, 1 from Japan and 1 from the Himalayas. Low-growing plants, with most of the leaves radical and long-petioled, simple or serrate, lobed or even 3-foliolate, with white flowers in terminal, simple or compound racemes: calyx-tube but slightly adnate to the base of the ovary; petals 5, entire; stamens 10, long: capsule superior, compressed, with 2 unequal lobes.

A. *Lvs. simple.*

B. *Petals oblong.*

cordifòlia, Linn. FOAM FLOWER. Fig. 2510. A handsome native perennial, forming a tufted mass, 6–12 in. high, of broadly ovate, lobed and serrate leaves and simple, erect racemes of white flowers borne well above the foliage in May. Fls. about ¼ in. across; petals oblong, clawed, somewhat exceeding the white calyx-lobes. In rich, moist woodland, Nova Scotia to Ontario, south to Ga. Gn. 22, p. 21; 32, p. 511; 53, p. 456; 55, p. 40; V. 11:35.—An elegant plant well worthy of general cultivation. It is a lover of cool, shaded places and of rich, moist soil. It will, however, do well in ordinary soil and flower freely in a half-shaded place, but the varied leaf-markings of bronzy red and other signs of luxuriance are not brought out to their fullest extent except with moisture, coolness and a fairly rich soil. The plant forces well and easily in a coolhouse for early spring flowering. It is tenacious of life and generally easy to manage.

2510. Tiarella cordifolia (× ¼).

BB. *Petals filiform, inconspicuous.*

unifoliàta, Hook. Hardy perennial: lvs. thin, rounded or triangular, 3–5-lobed, the lobes crenate-toothed; stem-lvs. usually only 1, rarely 2–3: panicle loose; petals small. W. Amer.—The lobing of the lvs., according to Bot. of Calif., varies so that it may pass into the next species.

AA. *Lvs. 3-foliolate.*

trifoliàta, Linn. Resembling *T. unifoliata* except in having 3-foliolate lvs. Ore. to Alaska. Also northwestern Asia.

F. W. Barclay.

TIBOUCHÌNA (native name in Guiana). *Melastomàceæ.* A genus of about 125 species, native to the warmer parts of North and South America but mainly from Brazil. Shrubs, herbs or climbers, with usually large ovate or oblong, 3–7-nerved lvs. and purple, rose, violet or rarely white fls., either solitary or in terminal panicles. Fls. 5-merous, rarely 4- or 8-merous; calyx ovoid or bell-shaped, the lobes as long as or longer than the tube; petals obovate, entire or retuse; stamens twice the number of the petals, nearly equal or alternately unequal: ovary free: fr. a capsule, 5–4-valved. D.C. Mon. Phaner. vol. 7.

semidecàndra, Cogn. (*Lasiándra macrántha*, Linden & Seem. *Pleròma macránthum*, Hook.). Fig. 2511. A tender shrub: lvs. ovate or oblong-ovate, 2–6 in. long, round at the base, short-petioled, densely setose above, villous beneath, not foveolate, 5-nerved or 3-nerved: bracts broadly suborbicular, somewhat rounded at the apex and shortly apiculate, margin not translucent: fls. reddish purple to violet, often 5 in. across, solitary and terminal or 1 fl. terminal and 2 in the upper axils on the branchlet; stamens purple; style setulose. Brazil. B.M. 5721; 4412 (as *P. Kunthianum*). F.S. 23:2430. Gn. 44:921. F. 1868:193. I.H. 16:594.

Var. **floribúnda** is more suited to pot culture in pots and flowers more freely when small than the type. *Lasiándra*, or *Pleròma spléndens*, Hort., should be compared with this. *T. semidecandra* is a plant of easy culture that has been highly praised by several connoisseurs. Cuttings struck in April will give bushy plants for fall and winter blooming. Handsome specimens may be had by keeping the same plant two or three years, training it to wires or stakes in a coolhouse where it has plenty of root room. The flowers last but a day or so, but new ones open up every day and the flowering season lasts for several weeks. Plants may also be used for summer bedding. They are seldom out of bloom. The species is much esteemed in Florida, where it makes a showy shrub 8 ft. high. It endures a few degrees of frost with impunity, and even if cut down it sprouts readily.

élegans, Cogn. (*Pleròma élegans*, Gardn.) Tender shrub, 3–6 ft. high: lvs. rigid, fragile, oblong or ovate-oblong, 3-nerved: fls. purple, 1½ in. across; calyx more or less armed with rigid spreading bristles which are thickened at the base. Brazil. B.M. 4262. P.M. 15:27. F.S. 12:1212 (as *Lasiandra elegans*).—Once cult. by John Saul.

F. W. Barclay.

TICKSEED is *Coreopsis*.

TICK TREFOIL. Refer to *Desmodium*.

TIEDEMÁNNIA rigida, Coult. & Rose, is a hardy native, white-flowered swamp herb, growing 2–5 ft. high from clustered tubers. It has pinnate lvs. with 3–9 leaflets. This was offered in 1890–91 by a collector of North Carolina plants, but is probably not in cultivation. For a fuller account, see Coulter and Rose's monograph of the North American Umbelliferæ (contrib. U. S. Nat. Herb. vol. 7, No. 1, p. 194), 1900; also Gray's Manual, and Britton and Brown's Illustrated Flora.

TI-ES. *Lucuma Rivicoa.*

TIGER FLOWER. *Tigridia.*

TIGER LILY. *Lilium tigrinum.*

TIGER'S JAW. Catalogue name for *Mesembryanthemum tigrinum.*

TIGRÍDIA (*tiger-like;* referring to the peculiarly marked flowers). *Iridàceæ.* Eight or ten species of cormous plants ranging from Mexico to Peru and Chile, and making very showy summer-blooming plants. Bulbs tunicated. Stem erect, unbranched, a few inches to 2½ ft. tall, with a few narrow plicate leaves at the

2511. Tibouchina semidecandra (× ⅓).

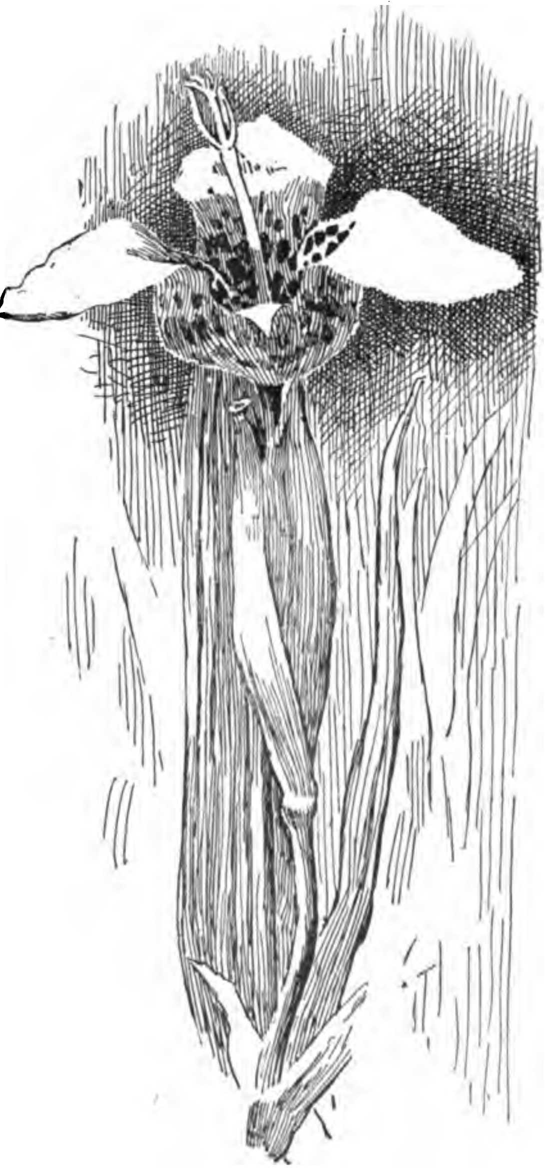
base and 2 or 3 smaller ones higher up: spathes 1 or 2, leaf-like, each bearing one or few blossoms. Flowers in shades of yellow, orange or purplish, variously spotted, often very showy; perianth wide-spreading, with no tube, the segments 6, in two dissimilar series, connivent into a broad cup at the base; stamens 3, the filaments united into a long cylindrical tube including the style; pistil with 3-loculed ovary, long style with three 2-parted branches. *Tigridia Pavonia*, from southern Mexico, was in cultivation in Europe in the sixteenth century. L'Obel described it in 1576. The younger Linnæus referred it to the genus Ferraria, and some of the Tigridias are yet cultivated under that name. Ferraria, however, is a South African genus, and all the parts of the perianth are nearly equal. *T. Pavonia* is cultivated in many forms, and is the only common species in gardens. The flowers of all Tigridias are fugitive, lasting only for a day. See Baker, Irideæ, 67 (1892).

Tigridias are tender "bulbs" requiring the treatment given Gladiolus. Plant in well-prepared soil when settled weather comes, 2 or 3 inches deep and 4 to 8 inches apart. The principal blooming period is July and August. Allow the corms to remain in the ground until danger of frost approaches, then store in a dry place where dahlias or gladioli will keep. See that the corms are dry before being placed in storage. Prop. by cormels and seeds. Best colors are got in warm weather.

A. *Fls. large (often 4 in. or more across): the two rows of perianth-segments very dissimilar: stigmas decurrent. (Tigridia proper.)*

Pavònia, Ker-Gawl. TIGER FLOWER. SHELL-FLOWER. Fig. 2512. Erect, usually unbranched, 1½ to 2½ ft. tall, glabrous, with several sword-shaped, strongly plicate long-pointed leaves, the spathe-leaves 3–5 in. long: fls. produced in succession through the warm season, very large and showy, in some forms 5 and 6 in. across, oddly marked, with a cup-shaped or saucer-shaped center and wide-spreading limb formed by the obovate outer segments which are bright red on the limb, and purple, yellow or red-spotted on the claw; inner segments panduriform (fiddle-shaped), about half the length of the outer ones, the blade ovate-acute, orange-yellow and copiously spotted. Mex. and Guatemala. B.M. 532 (as *Ferraria Tigridia*). I.H. 38:142. Var. **conchiflòra**, Hort. (*T. conchiflòra*, Sweet), has bright yellow flowers. Var. **Wátkinsoni**, Hort. (var. *aùrea*, Hort. *T. conchiflòra Wátkinsoni*, Paxt.). Raised from seeds of var. *conchiflora* pollenized by *T. Pavonia*, before 1840, by J. Horsefield, Manchester, England. Horsefield is quoted as follows by Paxton: "In habit and strength this hybrid resembles *T. Pavonia*, the male parent; but in color and the markings of the flower it resembles *T. conchiflora*, the female parent; the large outer sepals, however, are of a very deep yellow, inclining to orange, and sometimes elegantly streaked with red lines; whilst the spotted center equals, if not surpasses, the brilliancy of either of the species. One of its greatest merits is being so free a bloomer, and as easy to cultivate and increase as *T. Pavonia*, whereas *T. conchiflora* is rather delicate, increases slowly, and is easily lost." Dutch bulb dealers still offer it. P.M. 14:51. Var. **álba**, Hort., has white fls., but has red spots in the throat. Var. **álba immaculàta**, Hort., is a spotless white variety, a sport from var. *alba*. Gn. 49, p. 361. Var. **flàva**, Hort., has pale yellow fls. with red-spotted center. Gn. 50:1074. Var. **Canariénsis**, Hort., is also a pale yellow-fld. form, but named as if an inhabitant of the Canaries. Var. **lùtea immaculàta**, Hort., has pure yellow spotless flowers. Var. **ròsea**, Hort., has rose-colored fls., with yellow variegated center. Var. **lilàcea**, Hort., has lilac fls., with spotted center. Gn. 45:955. Var. **speciòsa**, Hort., is a partially dwarf form with deeper red color, the interior of the cup being similar in color to the limb. Described in 1843. Var. **grandiflòra**, Hort., has flowers much like those of *T. Pavonia* itself except that they are larger and brighter colored. Gn. 45, p. 263. Identical with this, or subtypes of it, are the forms known as *Wheeleri*, *coccinea*, *splendens*. Most of the marked departures in colors of *Tigridia Pavonia* are recent. In catalogues the above names often appear as if they were species names.

Pringlei, Wats. Distinguished by Sereno Watson, the author of the species, as follows: "Very closely related to *T. Pavonia*, and if color alone were to decide, it might be considered a variety of it, though differing markedly even in that respect from the old species. The base of the sepals is blotched (rather than spotted) with crimson, with a border of orange, the reflexed blade being of a bright scarlet-red. The petals have the base blotched and coarsely spotted with crimson, with a well-defined, deeper-colored, brownish margin, the blade orange, tinged with scarlet, but not at all spotted as in *T. Pavonia*. The more essential difference is in the form of the petals, which have a broadly cordate or reniform base, with a much narrower small triangular-ovate acute blade. The sepals are also smaller and more oblong in outline." Northern Mex. G.F. 1:389. B.M. 7089.—Offered to the trade by Horsford in 1889.



2512. Tiger-flower — Tigridia Pavonia (× ½).

AA. *Fls. relatively small: the two rows of segments differing less in size: stigmas capitate, or at least not strongly decurrent. Subgenus Beatonia.*

buccifera, Wats. About 1 ft. high, slender, branching, glaucous: lvs. very narrow, strongly plicate: fl. 2 in. across, the cup pale greenish yellow, dotted with purple, the obovate obtuse blade of the outer segments light purple; inner segments "folded together in such a manner as to form a sunken longitudinal tube down the center, the dilated sides at the outer end of the tube approaching each other in the form of two cheek-like prominences,—these are colored white, purple and yellow, while the small rounded terminal blade is a deep purple." Mts. of Jolisco, Mex. G.F. 2:413.—Offered in 1889 by Horsford.

T. aùrea, Hort., is Cypella plumbea, but it is not in the American trade. See page 429.—*T. Hoùttei*, Roezl, is Hydrotænia Van-Houttei. See page 787.—*T. Meleàgris*, Hort., is also a Hydrotænia (H. Meleagris, Lindl.), but is not in the American trade. B.R. 28:39.—*T. violàcea*, Schiede. One of the Beatonia section: slender, narrow-lvd.: fls. 2 in. across, violet, spotted at the base; inner segments small, cusp-pointed. Mex. B.M. 7356.

L. H. B.

TÍLIA (the classical Latin name). *Tiliàceæ.* LIME. LINDEN. BASSWOOD. WHITEWOOD. Trees distributed generally throughout the northern temperate zone, with soft, light, white or light-colored wood, tough fibrous inner bark, serrate alternate petiolate, mostly cordate lvs. and caducous stipules: inflorescence cymose, the peduncle attached to, or adnate with, for about half its length, a ligulate membranaceous bract: fls. small, yellowish; sepals 5; petals 5; stamens many, with long filaments nectariferous: fr. globose, nut-like. In some species, small petaloid scales are found among the stamens.

The soft white wood of several species is in great demand for making fruit, honey and other light packages, the facility with which the wood is cut into veneers rendering it admirable for such use. The fibrous inner bark is used as a tying material and in the manufacture of Russian bass or bast mats. Extensively planted as an ornamental tree and for bee pasture. As a source of honey supply perhaps no other plant excels it, as under favorable conditions the nectar sometimes drips from the flowers in a shower.

2513. A young Linden tree, five or six years old.

Nearly all the species are of rapid growth and not very particular as to soil. Propagated by seeds, layers or grafting. In layering, it is usual to twist the branch layered before covering it. The method known as "stooling" is also employed. In order to effect this a tree is cut close to the ground and the "stools" or suckers are banked up with earth until they root, when they are severed from the old stump and planted in the nursery rows. Rare varieties are usually increased by budding or grafting.

Much confusion exists in the trade names, especially in the European varieties. This is no doubt largely due to the fact that at least three species have been sent to this country under the name of *T. Europæa.*

INDEX.

alba, 1, 3, 4.
Americana, 6, 7.
argentea, 3.
aurea, 9.
Caroliniana, 7.
cordata, 12.
dasystyla, 10.
Europæa, 9, 11, 12.
grandifolia, 9.
heterophylla, 4
laciniata, 9.
macrophylla, 4, 7.
Mandshurica, 2.
microphylla, 12.
Miqueliana, 5.
Moltkei, 7.
Mongolica, 8.
parvifolia, 12.
pendula, 1, 7.
petiolaris, 1.
platyphyllos, 9.
pubescens, 6.
pyramidalis, 3, 9.
rubra, 9.
Sibirica, 12.
spectabilis, 3.
sulphurea, 9.
tomentosa, 3.
ulmifolia, 12.
vitifolia, 9.
vulgaris, 11.

A. *Fls. with petaloid scales at the base of petals: petals upright, longer than stamens.*
  B. *Lvs. whitish tomentose beneath.*
    C. *Fr. with 5 furrows.*
      D. *Cymes few-fld.: fr. with no cavity at the base* .... 1. **petiolaris**
      DD. *Cymes many-fld., dense: fr. with a cavity at the insertion of the pedicel: lvs. large* .... 2. **Mandshurica**
    CC. *Fr. without furrows.*
      D. *Shape of lvs. orbicular, abruptly acuminate: fr. slightly ribbed* .... 3. **tomentosa**
      DD. *Shape of lvs. ovate, gradually acuminate*
        E. *Winter-buds glabrous: lvs. broadly ovate: fr. not ribbed* .... 4. **heterophylla**
        EE. *Winter-buds pubescent: lvs. ovate: fr. slightly ribbed at base* .... 5. **Miqueliana**
  BB. *Lvs. green beneath or glaucous. and glabrous*
    C. *Under side of lvs. pubescent at least when young* .... 6. **pubescens**
    CC. *Under side of lvs. glabrous.*
      D. *The lvs. large, serrate and abruptly acuminate* .... 7. **Americana**
      DD. *The lvs. small, usually 3-lobed, long-cuspidate* ...... 8. **Mongolica**
AA. *Fls. without petaloid scales: petals spreading, shorter than stamens.*
  B. *Lvs. pubescent beneath: fr. 5- or 4-ribbed* .... 9. **platyphyllos**
  BB. *Lvs. glabrous beneath, except tufts in the axils of the veins: fr. without ribs.*
    C. *Under side of lvs. green.*
      D. *Branches bright yellow or red in winter: lvs. very glossy above, rather leathery* .....10. **dasystyla**
      DD. *Branches greenish or reddish brown: lvs. thin, slightly glossy* ....11. **vulgaris**
    CC. *Under side of lvs. glaucous* ....12. **ulmifolia**

1. **petiolàris,** DC. (*T. Americàna*, var. *péndula*, Hort. *T. argéntea*, var. *péndula*, Hort. *T. álba*, var. *péndula*, Hort. *T. péndula*, Hort.). SILVER LINDEN. WEEPING LINDEN. A medium-sized species with slender somewhat pendulous branches: lvs. pale green above, silvery and finely tomentose underneath, 3–5 in. long; petiole slender, as long as the blade. July. E. Europe. B.M. 6737. Gng. 5:210.—An elegant species and one of the best of the European kinds, holding its foliage throughout the season.

2. **Mandshùrica,** Rupr. & Maxim. Tree, attaining 50 ft., with spreading, often somewhat pendulous branches: lvs. large, 5–8 in. long, orbicular to broadly ovate, cordate or truncate at the base, rather coarsely and remotely serrate with spreading teeth: floral bract adnate almost to the base of peduncle: fr. globose, thick-shelled, with 5 furrows and a slight cavity at the insertion of the pedicel. E. Asia.—A variety has the lvs. edged with yellow or a lighter green.

3. **tomentòsa,** Moench (*T. argéntea*, DC. *T. álba*, Waldst. & Kit., and probably Ait. *T. álba*, *T. álba*, var. *spectábilis* and *T. álba*, var. *pyramidalis*, Hort.). WHITE OR SILVER LINDEN. This is the larger "White Lime" of Europe. Tree, 40 ft. high with upright or ascending branches forming a pyramidal rather dense and compact head: lvs. suborbicular, 3–5 in. across, unequally cordate, serrate, densely white-tomentose beneath; blade 2–4 times longer than petiole: fr. tomentose and slightly ribbed. Very variable in time of flowering. Eastern Europe.—This is a very distinct and striking species.

4. **heterophýlla,** Vent. (*T. álba*, Michx., not Ait.). Tree, attaining 70 ft.: lvs. very large, 5–8 in. long, smooth and shining above, whitish and tomentulose beneath: floral bract short-stalked: fr. globular, not

ribbed. July. Alleghanies. S.S. 1:27.—This has been sent out as *T. macrophylla*, a name that properly belongs to a large-leaved var of *T. Americana.*

5. **Miqueliàna,** Maxim. Tree, attaining 100 ft., with usually an oblong head: lvs. ovate, truncate or slightly cordate at base, gradually acuminate, rather coarsely serrate with incurved teeth, 4–6 in. long: floral bract adnate almost to the base of the peduncle: fr. globose, thick-shelled, 5-ribbed only at the base. Japan. G.F. 6:113.

6. **pubéscens,** Ait. (*T. Americàna.* var. *pubéscens*, Loud.). Similar to the better known *T. Americana*, but a smaller tree: winter-buds finely pubescent: lvs. smaller, obliquely truncate at the base, glabrous above, pubescent beneath: floral bract usually rounded at base: fr. globose. June. Long Island to Fla., west to Tex. S.S. 1:26.—Less ornamental than *T. Americana* and but rarely cult.

7. **Americàna,** Linn. (*T. Caroliniàna*, Hort.). AMERICAN LINDEN. BASSWOOD. Fig. 2514. Stately tree with large cordate lvs. shining above, usually smooth except for the tufts of hairs in the axils of veins: floral bract very large, tapering to a more or less stalked base: fr. ovoid, tomentose. July. E. N. Amer. S.S. 1:24. Mn. 6:153.—This is our most common American species and the one most frequently planted. Variable in its habit, size and shape of lvs. and in the color of its bark. As a forest tree it was formerly abundant in the eastern and middle states, but with the general destruction of the forests and the greatly increased demand for its white wood for manufacturing purposes, good specimens are becoming scarce, and the source of supply is constantly moving westward. Vars. in the trade are **macrophýlla,** Hort., a large-lvd. form; **Mòltkei,** Hort., a very strong-growing large-lvd. form which originated in cultivation in Europe. What is sold sometimes as *T. Americana*, var. *pendula*, is a form of *T. petiolaris.*

8. **Mongòlica,** Maxim. A slender tree with very small orbicular or ovate lvs., truncate at the base, usually 3-lobed, cuspidate, coarsely serrate with acuminate teeth, glaucous beneath or green on vigorous shoots: cyme rather dense, with the stalk naked at the base. E. Asia.

9. **platyphýllos,** Scop. (*T. grandifòlia*, Ehrh.). This is the broad-leaved Linden of European plantations and probably the largest. It attains 90 ft. Lvs. large, green, pubescent, often on the upper side to some extent, unequally cordate, petioles and veins hairy: fr. 5, rarely 4-angled, tomentose, thick-shelled. This is the species most commonly sold here as *T. Europæa*, and the earliest to flower. June. Eu. G.F. 2:256.—The following varietal names in the American trade seem to belong here: **pyramidàlis,** an upright grower with reddish shoots; **rùbra,** bark of branches very red: **aùrea,** with yellow bark on branches; **laciniàta** and **laciniàta rùbra,** with deeply cut leaves and reddish young bark; **sulphùrea,** probably the same as aurea; **vitifòlia,** the vine-leaved Linden with lobed leaves.

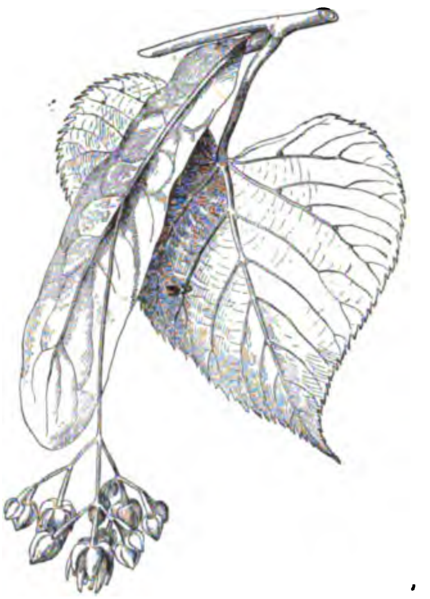
10. **dasýstyla,** Stev. CRIMEAN LINDEN. Lvs. tough and leathery, dark glossy green above and pale beneath, with tufts of brown hairs in the axils of the principal veins: bark of young branches bright green: lvs. often obliquely truncate at base. E. Eu., W. Asia.

11. **vulgàris,** Hayne (*T. Europæa*, Hort., in part). This species grows nearly as large as *T. platyphyllos*, has large unequal or oblique cordate lvs., smooth and green on both sides; tufts of hairs in axils of veins whitish: fr. globose or oval, tomentose, shell thick, June, July. Eu. G.F. 2:256.—This is said to be the celebrated species of Berlin and is often sold in this country under the name of *T. Europæa*. It is a week or ten days later in blooming than *T. platyphyllos*, and about the same number of days earlier than *T. Americana.*

12. **ulmifòlia,** Scop. (*T. cordàta*, Mill. *T. parvifòlia*, Ehrh. *T. Sibírica*, Boyer. *T. Europæa*, in part. *T. microphýlla*, Vent.). Of slower growth and usually smaller tree than the *T. platyphyllos:* lvs. small, thin, cordate, green above, silvery beneath, with tufts of rusty hairs in the axils of the veins: fr. globose, sometimes slightly ribbed, very thin-shelled. July. Eu. G.F. 2:257.—Very late in flowering.

JOHN F. COWELL.

TILLAGE. The working or stirring of the land, in order to improve it for agricultural purposes, is known by the general name of tillage. There is a tendency to use the word cultivation for these operations. Tillage is a specific technical term, and is to be preferred. In the eager discussions of scientific matters, as applied to agriculture in recent years, there is danger of forgetting that the fundamental practice in all kinds of farming is, after all, the tillage of the land. The knowledge of the importance of tillage has developed late in the world's history. In fact, it is only within the latter part of the century just closed that the real reasons for tilling have come to be popularly understood in this country. Even now there are many persons who believe that the object of tillage is to kill weeds. The modern conceptions of tillage probably date from Jethro Tull's book on "Horse-Hoeing Husbandry," which reached the second and full edition in 1733, in England. This book awakened so much discussion that the system of "horse-hoe husbandry" recommended by it was called the "new husbandry." There had been tillage of land before Tull's time, but his writing seems to have been the first distinct effort to show that tillage is necessary to make the soil productive rather than to kill weeds or to open the ground to receive the seeds. He contrived various tools whereby grain crops could be sown in rows and afterwards tilled. The tillage of the land in early times was confined very largely to that which preceded the planting of the crop. In the vineyards of southern Europe, however, Tull observed that tillage was employed between the vines during the season of growth. Such vineyards prospered. He made experiments and observations on his return to England and came to the conclusion that tillage is of itself a very important means of making plants thrifty and productive wholly aside from its office of killing weeds. He supposed that tillage benefits plants by making the soil so fine that the minute particles can be taken in by the roots of plants. Upon the same hypothesis he explained the good effects of burning or "devonshiring" land, and also the benefits that followed the application of ashes: the minute particles of the ashes are so small as to be absorbed by roots. Although this explanation of the benefits of tillage was erroneous, nevertheless Tull showed that tillage is necessary to the best agriculture and that it is



2514. Basswood or American Linden — Tilia Americana. (× ⅓.)

not merely a means by which seeds can be put into the land, weeds killed, and the crop taken out.

Tillage improves land in many ways. It divides and pulverizes the soil, gives the roots a wider "pasturage," as Tull puts it, increases the depth of the soil, and improves its physical condition with respect to warmth and dryness.

Tillage also saves moisture by deepening the arable soil so that moisture is held, and also by checking evaporation from the surface by means of a thin blanket or mulch of pulverized earth that is made by surface-working tools. Water is lost from the soil by under-drainage and by evaporation from the surface. The more finely the soil is pulverized, within certain limits, the more water it will hold. Its capillary power is increased. As the water evaporates from the surface, the moisture is drawn up from the under surface so that there is a more or less constant flow into the atmosphere. If any foreign body, as a board or a blanket, is spread on the land, the evaporation is checked. A similar result follows when the soil is covered with a layer of dry ashes or sand or sawdust. Very similar results are also secured when the surface is made fine and loose by means of frequent shallow tillage. The capillary connection between the surface soil and the under soil is thereby broken. This surface soil itself may be very dry, but it serves as a blanket or mulch to the soil beneath and thereby keeps the under soil moist. In many instances this conservation of moisture by frequent shallow tillage is the chief advantage of the tillage of the land during the growing season.

2515. Cryptanthus zonatus, commonly known as Tillandsia zebrina (× ¼).

Land that is well tilled has different chemical relations from that which is neglected. Nitrification, decomposition and other chemical activities are hastened. The stores of plant-food are rendered available. The soil is made more productive.

The first requisite for the growing of the plant is to have the soil in such condition that the plant can thrive in it. It is only when the land is well tilled and prepared, or when its physical condition is nearly or quite perfect, that the addition of concentrated fertilizers may be expected to produce the best results. The fertilizing of the land, therefore, is a secondary matter; tillage is primary.

The ideal tillage of the land is that which is practiced by the gardener when he grows plants in pots. The soil is ordinarily sifted or riddled so that unnecessary parts are removed, and most of it is brought into such condition that the plants can utilize it. The gardener adds leaf-mold or sand or other material, until the soil is brought into the proper physical condition. He also provides drainage in the bottom of his pots or boxes. Often the gardener will produce as much from a handful of soil as a farmer will produce from a bushel.

L. H. B.

TILLÁNDSIA (Elias Tillands was professor of medicine at the University of Abo, Sweden; in 1673 made a catalogue of plants of the vicinity of Abo). *Bromeliàceæ.* Tillandsias are mostly epiphytes and all natives of America. They are allied to billbergias, æchmeas, guzmanias, pineapples, and the like. Many species are described in horticultural literature as having been introduced into cultivation, but most of these are known only to amateurs and in collections where species of botanical interest are chiefly grown. In the American trade about 30 names occur, many of which are to be referred to other genera. The generic limits of Tillandsia, as of most bromeliaceous genera, are ill defined. By different authors a given species may be placed in any one of a half dozen genera. Lately, Tillandsia and Vriesia have been merged, but in this book Vriesia is kept distinct, following Mez's monograph. It is useless to attempt a description of all the Tillandsias that by chance may occur in collections. Persons who want to know the species other than those regularly in the trade should consult Baker's "Handbook of the Bromeliaceæ," 1889, or Mez's "Bromeliaceæ" in DeCandolle's "Monographiæ Phanerogamarum," 1896. The latter work, which regards Vriesia as a separate genus, admits 248 species of Tillandsia. Some of these species extend northward into the United States, growing chiefly in Florida, although one or two reach southern Georgia, and the Spanish moss (which is *Tillandsia usneoides*) reaches Virginia and is common throughout the South. The native upright Tillandsias are not in the general trade, but they are offered by one dealer in southern Florida: of such are *T. recurvata*, *T. tenuifolia*, *T. fasciculata*, *T. utriculata*.

Tillandsias are usually known as "air-plants" to gardeners. They are perennial herbs, mostly of upright growth (the common *T. usneoides* being a marked exception), the bases of the narrow entire leaves often dilated and forming cups that hold water and in which utricularias and other water plants sometimes grow. The flowers are usually borne in spikes or heads, singly beneath bracts; they are perfect, with 3 sepals and 3 petals which are twisted or rolled in the bud, 6 stamens, a superior ovary with filiform style: fr. a 3-valved capsule, containing hairy or plumose seeds. Vriesia is distinguished by having one or two scales or ligules at the base of the petals on the inside, whereas the petals of Tillandsia are eligulate; however, there are intermediate forms and it is sometimes a matter of individual opinion as to which genus shall receive a given species. Some of the cultivated Tillandsias belong to still other genera. This is the case with *T. zebrina*, which is properly *Cryptanthus zonatus* (Fig. 2515). This is an odd plant, producing crinkled deflexed saw-edged leaves, which are whitish beneath and brown-barred above, and small clusters of white flowers. See p. 404, where other kinds of Cryptanthus in the American trade are described.

Tillandsias are grown both for foliage and for flowers. The foliage is usually scurfy and sometimes blotched. Many of the species are very showy when in bloom, sending up strong central clusters of blue, violet, red, yellow or white flowers. In nature, the seeds are carried in the wind by means of the soft hairs, and find lodgment on trees, where the plants grow. A few species, however, grow on the ground. In cultivation, most of the species are treated as pot-plants. The growing season is summer. In winter the plants should be kept nearly dormant, although not completely dry. They need a warm temperature and plenty of light while growing. Give a soil rich in peat. In some cases sphagnum may be added to advantage. Prop. by suckers; also by seeds. For further cultural notes, consult *Billbergia*. Other bromeliaceous genera described in this book are Bromelia, Æchmea, Karatas, Cryptanthus, Ananas, Pitcairnia, Puya, Guzmania.

A. *Plant-body slender and hanging: fls. solitary in leaf axils.*

usneoides, Linn. Spanish, Florida or Long Moss. Figs. 2516, 2517. Whole plant hoary-gray, hanging from trees; the stems very slender and often several feet long: lvs. scattered, narrow-linear, 1–3 in. long: fls. solitary in the leaf-axils, small and not showy, the petals yellow and reflexed at the end. Trop. Amer. and in the U. S. from Texas to Fla. and eastern Virginia; extends southward to southern Brazil. B.M. 6309. Gn. 37, p. 221. Gt. 45, p. 267.—This is one of the most characteristic plants of our southern regions. In moist regions it gives a most weird aspect to the forests. It is used as a packing material, and also, when specially prepared, for upholstery. It is rarely cultivated, although it is not uncommon in greenhouses, being hung on branches and beams; but it must be renewed frequently. The plant is named for its resemblance to the lichen Usnea.

2517. The Spanish Moss—Tillandsia usneoides, hanging from the trees. Gulf coast.

AA. *Plant-body stiff and nearly or quite erect.*

B. *Stamens shorter than the petals.*

C. *Fls. few in the cluster.*

recurvàta, Linn. (*T. Bártrami*, Ell., at least in part). A few inches high, tufted, with scurfy terete or filiform recurved 2-ranked lvs.: fls. 1–5 on a spike that is sheathed at the base but naked above, the corolla blue and exceeding the calyx. Florida to Argentina and Chile.

CC. *Fls. many, distichous.*

ánceps, Lodd. (*Vrièsia ánceps*, Lem.). Erect, the flower-stem 6–12 in. tall and bearing a spike with large distichous green bracts from which small blue fls. emerge: lvs. stiff, about 1 ft. long, dilated and striped at the base: fls. 2 in. or less long, blue or purplish, the perianth much exceeding the calyx. Costa Rica, Trinidad. L.B.C. 8:771.

2516. Spanish Moss—Tillandsia usneoides. (Much reduced.)

Lindeniàna, Regel (*T. Lindeni*, Morr. *Vrièsia Lindeni*, Lem.). Lvs. rosulate, about 1 ft. long, dilated at the base, long recurving: spike large, the showy distichous bracts carmine: fls. large, much exserted beyond the bracts, the large wide-spreading segments bluish purple. Ecuador, Peru. I. H. 16:610; 27:370 (as var. **Regeliàna**). G.C. II. 12: 461. R. H. 1872:230; 1898: 206 (as var. **tricolor**). F.M. 1872:44.—A handsome and popular species.

BB. *Stamens longer than the petals.*

C. *Stem thickened and bulb-like at the base.*

bulbòsa, Hook. Small scurfy plant a few inches high, the stem swollen at the base: lvs. 3–5 in. long, much dilated and clasping at the base and terete above: fls. few, in racemose short spikes, long and narrow, the much exserted but not spreading petals purple. Var. **picta,** Hook., has the upper lvs. and bracts scarlet. S. Fla. to Venezuela. B.M. 4288. F.S. 3:221.

CC. *Stem not prominently swollen.*

D. *Lvs. linear or filiform from the base or abruptly from a dilated base.*

polystàchya, Linn. (*T. angustifòlia*, Swartz. *T. parvispica*, Baker). Lvs. rosulate, lepidote or scurfy, curved, equaling or exceeding the stem: inflorescence compound, somewhat paniculate, the lateral spikes shorter than the central ones, the bracts distichous and pointed and little exceeding the calyx: fls. blue. S. Fla. to Brazil.

tenuifòlia, Linn. (*T. cæspitòsa*, Leconte, not Cham. & Schlecht. *T. Bártrami*, Ell. in part). Plant less than 6 in. tall, reddish, clustered: lvs. awl-shaped and erect, nearly terete, concave at the base, scurfy: fls. few in a simple or somewhat compound spike, the blue petals exceeding the bracts and recurving at the apex. Fla. to Brazil.

DD. *Lvs. gradually narrowed from a broad base.*

fasciculàta, Swartz (*T. bracteàta*, Chapm. *T. glaucophýlla*, Baker. *Vrièsia glaucophýlla*, Hook.). Tall, strong species with stem 2 ft. tall: lvs. 1–1½ ft. long, concave or channeled above, erect or ascending, scurfy and bluish; stem longer than the lvs. and branched, the branches or spikes bearing distichous keeled acute mostly greenish and red-tinged bracts: fls. narrow, exserted, blue. S. Fla., West Indies and Central Amer. B.M. 4415. F.S. 5:432.—Very variable.

utriculàta, Linn. Plant 2–3 ft. high: lvs. glaucous and scurfy, becoming subulate and recurved at the summit but much dilated and imbricated at the base and forming pockets that hold water: inflorescence branched, the fls. far apart on the branches: fls. pale blue (pale colored forms), narrow, the petals twice longer than the sepals. S. Fla. to S. Amer. B.R. 9:749 (as *T. flexuosa*, var. *pallida*).—For full description of this species, together with plate, see Trelease, 5th Rept. Mo. Bot. Gard. (1894).

T. bivittàta, Linden, is Cryptanthus bivittatus. See p. 404.—*T. farinòsa*, Hort., is Billbergia pyramidalis. See p. 163.—*T. La Salliàna:* "A new species from South America, with most brilliant flowers. It is of free growth and easily cultivated, thriving best in a moderate temperature and in a light, fibrous soil mixed with sphagnum." (Siebrecht.)—*T. musàica*, Linden, is properly Guzmania musaica, Mez. It is acaulescent: lvs. 20 or less in a rosette, lorate and obtuse but with a cusp, with transverse lines on both surfaces: fls. in a rounded head on the end of a red-bracted scape, the corolla white. Colombia. B.M. 6675. I.H. 24:268 (as Caraguata musaica). It is an excellent plant, with broad lvs. 2 ft. long. In the American trade. This plant is sometimes known as a Massangea (see p. 992).—

T. muscòsa, Hort., is Pitcairnia muscosa. P. muscosa, Hook., B.M. 4770, is Pitcairnia Beycalema. The name T. muscosa has occurred in the trade, but the plant is unknown to the writer. —*T. Wilsoni*, Wats., has been introduced sparingly to cultivation, but does not appear to be in the trade. It was discovered in Hernando county, Fla., in 1887 by Dr. W. P. Wilson, of the University of Pennsylvania: "Stem simple, very short (about ½ inch): lvs. numerous, 1 to 3 or 4 inches long, gradually narrowed from the clasping base to the long-attenuate apex, channeled above, more or less hoary, with minute appressed, peltate, brown-centered scales: peduncle very slender, recurved, about equaling the lvs., with 2 distinct bracts, probably 1–3-fld.: fls. and capsules not seen." This is Sereno Watson's original description, 1888. See Mn. 2, p. 180, and 6, p. 130, for pictures of what purport to be this species.—*T. Zàhnii*, Hort., is properly Guzmania Zahnii, Mez. Tufted, branching from the base, glabrous throughout: lvs. 1 ft. long, about 1 in. broad, crimson striped and yellow: inflorescence paniculate, subtended by scarlet bracts: fls. yellow. Costa Rica. B.M. 6059, as Caraguata Zahnii. In the trade.

The following names are accounted for under Vriesia: *carinata*, *fenestralis*, *guttata*, *hieroglyphica*, *psittacina*, *Saundersii*, *splendens*, *tessellata*, *zebrina* (in part). L. H. B.

TIMOTHY. *Phleum pratense.*

TINÀNTIA fùgax, Scheidw., is sometimes seen in old gardens but is not in the trade. It is a tradescantia-like herb from tropical America, with blue fls. in bracteolate curved terminal clusters. 1–2 ft. Grown indoors and out. Known also as *Tradescantia erecta*, *T. undata*, *T. latifolia*. B.M. 1340. B.R. 17:1403. L.B.C. 13:1300.

TIPUÀNA (name apparently Latinized from a Brazilian name). *Leguminòsæ*. A genus of 3 species of handsome South American trees with odd-pinnate lvs., numerous alternate lfts. and showy yellow or purplish fls. in loose, terminal panicles. Here belongs the plant recently introduced to southern Calif. as *Machærium Tipu*, which Franceschi says yields one of the rosewoods of southern Brazil.

speciòsa, Benth. (*Machærium Tipu*, Benth.). Tender yellow-fld. tree; lfts. 11–21, oblong, emarginate, entire, 1½ in. long: veins somewhat parallel: standard broadly orbicular: wings very broadly ovate, much larger than the keel: pod veiny. S. Amer.

TIPULÀRIA (Latin, *Tipula*, a genus of insects, alluding to the form of the flower). *Orchidàceæ*. Includes 2 species of small terrestrial orchids in N. America and the Himalaya region. Herbs with solid bulb, having several generations connected by offsets: leaf solitary, basal, appearing in autumn long after the flowering season: fls. in a long, loose, terminal raceme, green, nodding; sepals and petals similar, spreading; labellum 3-lobed, produced into a long spur behind; column erect, wingless or narrowly winged.

discolor, Nutt. CRANE-FLY ORCHIS. Scape 15–20 in. high: leaf ovate, 2–3 in. long, appearing in autumn and often surviving through the winter: raceme 5–10 in. long, loose: fls. green, tinged with purple. July, Aug. Vt. and Mich. to Fla. and La. B.B. 1:480.—Rare. Advertised by dealers in Dutch bulbs. HEINRICH HASSELBRING.

TOAD FLAX. *Linaria vulgaris.*

TOADSTOOL. Consult *Mushroom* and *Fungi*.

TOBACCO is considered to be an agricultural rather than a horticultural crop and hence is not treated at length in this work. See *Nicotiana* for an account of the cultivated species of the genus to which Tobacco belongs.

TOCÒCA (Tococo is the native name of *T. Guianensis*). *Melastomàceæ*. A genus of 38 species of tropical shrubs native to the northern part of South America, including several handsome foliage plants for hothouses. Their beauty is similar to that of the well-known Cyanophyllum, for which see *Miconia*. The lvs. are usually ample, petiolate, membranous, rarely leathery, entire or denticulate, usually 5-nerved: fls. rather large, borne in terminal or sometimes axillary panicles, white, red or rosy, 5-merous, rarely 6-merous; stamens 10: ovary 3-loculed, rarely 5-loculed.

platyphỳlla, Benth. (*Sphærógyne latifòlia*, Naud.). Short-stemmed plant with succulent, somewhat tortuous stem: lvs. broadly ovate, minutely denticulate-ciliate, 7-nerved: fls. rosy or red: ovary 5-loculed. Colombia, Venezuela, Costa Rica.—Cogniaux puts this species in a section characterized by having the lvs. destitute of vesicles and the calyx not winged. In this section it is unique by reason of its herbaceous branches with long bristles, especially at the nodes; the other species of the section have shrubby and glabrous branches. A very beautiful plant, but considered to be difficult to grow. W. M.

Tococa requires a warmhouse temperature, with shady and fairly moist place. Use leaf-mold mixed with fibrous loam, and provide ample drainage. It is best propagated from what are called split joints, or eyes with the leaf rolled up, and inserted in thumb-pots in fine sand with chopped moss; then insert pot in sand or cocoa fiber, with bottom heat of 75–80°. Cover with bell-glass or other inclosure to exclude air and to keep a fairly moist (but not wet) condition. In about two months the cuttings will have rooted. The wood for propagating should be well ripened.

H. A. SIEBRECHT.

TODDÀLIA (*Kaka Toddali*, Malabar name of *T. aculeata*). *Rutàceæ*. About 8 species of trees, shrubs and climbers native to the Old World tropics and the Cape. Lvs. alternate; lfts. in 3's, shining, leathery, full of fine veins, glandular-dotted, with a wavy vein inside the margin: fls. small, copious, in dense panicles; sepals 4–5, minute; petals 4–5, valvate or imbricate; stamens as many, or twice as many, as petals: ovary 4–5-loculed; stigma peltate: fr. hard, coriaceous, globose, permanently syncarpous. In Toddalia proper the petals are valvate, and the stamens as many as the petals; in the subgenus Vepris (name altered from *vepres*, bramble) the petals are imbricate and the stamens twice as many as the petals.

lanceolàta, Lam. (*Vepris lanceolàta*, A. Juss.). Small tree or large shrub, erect, without prickles, entirely glabrous: petioles 1–2 in. long; lfts. oblong-lanceolate, 2–3 in. long, acute, entire, waved at the edge, ¾–1 in. broad: panicles axillary and terminal, thyrsoid: petals a line long, imbricate; stamens 8, in the male fls. exserted: fr. the size of a pea, 4-lobed, fleshy, gland-dotted. Mauritius, Mozambique, Cape. Int. by Reasoner Bros., 1891. W. M.

TODÈA (Tode, a German botanist). *Osmundàceæ*. GRAPE FERN. A genus of ferns related to Osmunda but with the sporangia borne on the under surface of the leaf. The last three species, although frequently united with Todea, more properly form a distinct genus Leptopteris, differing widely in habit from the original Todea; they form delicate foliage plants resembling the filmy ferns in habit.

For culture, see *Ferns*.

A. *Texture leathery: lvs. bipinnate.*

bárbara, Moore (*T. Africàna*, Willd.). Lvs. in a crown rising from a short caudex, 3–4 ft. long, 9–12 in. wide; pinnæ erect spreading, sometimes 2 in. wide: sori closely placed, often covering the whole under surface at maturity. South Africa to New Zealand.

AA. *Texture thin: lvs. with linear divisions.*

B. *Lvs. tripinnatifid.*

hymenophylloides, Rich. & Less (*T. pellùcida*, Hook.). Lvs. 1–2 ft. long, 8–12 in. wide, lowest pinnæ about as long as the others; rachises mostly naked. New Zealand.

supérba, Col. Lvs. 2–4 ft. long from a woody caudex; pinnæ often crisped, the lower gradually reduced; rachises densely tomentose. New Zealand.

BB. *Lvs. bipinnate.*

Fràseri, Hook. & Grev. Lvs. 1–2 ft. long, from an erect woody caudex 18–24 in. high, lowest pinnæ nearly as large as the others: rachis narrowly winged, naked. Australia. L. M. UNDERWOOD.

TOLMIÈA (Dr. Tolmie, surgeon of Hudson Bay Co., at Puget Sound). *Saxifragàceæ*. A genus of one species, a western relative of the Bishop's Cap or Mitella,

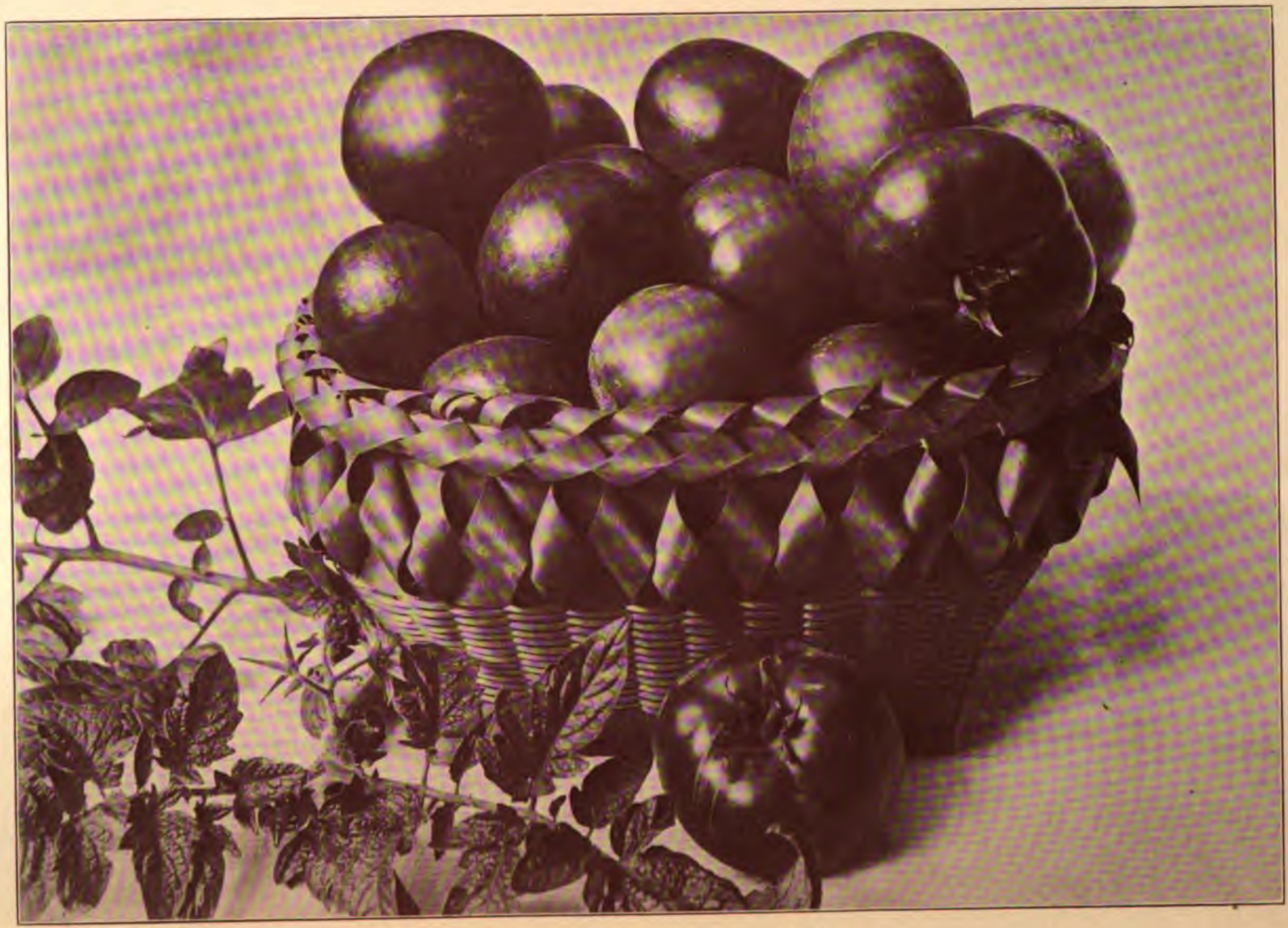


Plate XLII. The modern type of Tomato—large, round and "smooth."

and with the same style of beauty. It is a perennial herb 1–2 ft. high, with loose racemes of small greenish or purplish flowers. The species seems to have been cult. abroad, and twenty years ago it was offered in the eastern U. S. for western collectors. It is probably hardy and doubtless requires some shade.

Generic characters: calyx funnelform, gibbous at base, 5-lobed, the tube in age longitudinally splitting down one side; petals 5, threadlike, inserted in the sinuses of the calyx, recurved, persistent; stamens 3: ovary 1-loculed, with 2-parietal placentæ. This plant has been described under Tiarella and Heuchera, which it resembles in foliage and inflorescence. It seems to be the only plant of the Saxifrage tribe that has 3 stamens.

Ménziesii, Torr. & Gray. Perennial herb, 1–2 ft. high, with slender creeping rootstocks and some summer runners: lvs. round-cordate, more or less lobed and crenately toothed, slender-stalked, all alternate, those of the stem 2–4 in number: raceme ¾–1½ ft. long: fls. and capsule nearly ½ in. long, greenish or tinged purple. Forests of Mendocino Co., Calif., to Puget Sound. —Propagates naturally by adventitious buds, produced at the apex of the petioles of the radical lvs. and rooting when these fall to the ground. W. M.

TOMATO (Plate XLII). The Tomato is *Lycopersicum esculentum* (which see), one of the solanum or nightshade family and closely allied to the potato. In fact, the potato and Tomato can be grafted on each other with ease, although they will not cross. The graft produces no practical results, however (see Bull. 61, Cornell Exp. Sta.). The Tomato is grown more extensively in North America than elsewhere in the world, and the varieties have here reached a higher degree of perfection. The American standard or ideal is a Tomato that is nearly globular, solid and "smooth" (that is, not wrinkled). Figs. 2518–20. The flat angled and wrinkled Tomatoes (Fig. 2526; 1334, Vol. II) are now little grown in this country. These forms are little adapted to canning, to which use enormous quantities of Tomatoes are put, and they do not satisfy the popular ideal or desire. The old-time pear, cherry, and plum forms (Figs. 2521, 2522) of Tomatoes are still grown for curiosity and also for the making of pickles and preserves, but their field culture is relatively not important. The currant Tomato, grown for ornament and curiosity, is *Lycopersicum pimpinellifolium* (Fig. 2523). It sometimes hybridizes with the common species (Fig. 1338, Vol. II).

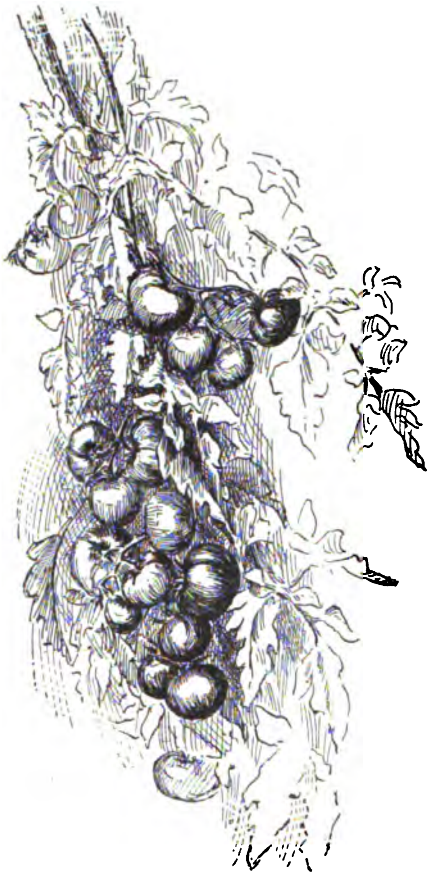
The Tomato requires a warm soil and climate, a sunny open position, and a long season. The plants are usually started in hotbeds or glass houses, being transferred to the open as soon as settled weather comes. The plants are usually set from 4–5 feet apart each way and are allowed to grow as they will, finally covering the ground. For home use, however, the plants are often trained, in order to forward their ripening and to secure larger and better colored fruits. The best method is to train to a single stem, as recommended for forcing below. The stem is supported by a stake or perpendicular wire or cord (Fig. 2524); or sometimes it is tied to the horizontal strands of a trellis. This single-stem training requires close attention, and if the time cannot be spared for it, the vines may be allowed to lie on an inclined trellis or rack. This rack training keeps the plants from the ground and thereby allows the individual fruits to develop perfectly and also checks the spread of the fruit-rot; but it usually does not give such perfect fruits as the single-stem training, since the number of fruits is limited in the latter. The most serious general difficulty in Tomato growing is the rot of the fruit. This usually causes most damage, following close, wet weather when the fruit is ripening. It is apparently worst on plants that cover the ground thickly with foliage and do not allow it to become dry on the surface. Usually it does not seriously lessen the crop beyond a few pickings; and if the plants are brought into bearing early and are kept in thrifty condition for subsequent bearing, the percentage of total injury is greatly reduced. The Tomato is tender to frost. The green fruit remaining when frost kills the plants may be ripened in tight drawers or cupboards, if it is nearly or quite full grown. The Tomato is probably a short-lived perennial; but in cold climates it is grown as an annual from seeds. L. H. B.

General Advice on Tomato Culture. — The Tomato comes from tropical America and in its natural habitat the conditions of temperature and moisture during the entire growing season are constantly favorable for its rapid development. The plant is adapted to such conditions, and if we are to have the best possible results with it under cultivation we must provide them and see that it has a steady and unchecked growth from the germination of the seed to the ripening of the fruit. It is true that the plant will live through considerable degrees of cold, wet, drought and other untoward conditions, and often seemingly recover from their ill effects and make a vigorous growth. But we believe it is true that any check in the growth of a Tomato plant, particularly if it occurs when the plant is young, will surely lessen the quantity and lower the quality of the fruit produced. This is a strong statement, but we are convinced of its truth by scores of experiences like the following: Two adjacent fields of similar character were set with plants from the same coldframes. Those in one field were carelessly set out just before a cold, dry wind-storm and received a check in transplanting, the effect of which was evident for at least ten days; but the plants ultimately became as large as those in the second field, which had been kept in the coldframe during the storm and were set out rather more carefully than the first lot, but six days later. They suffered scarcely perceptibly from the transplanting, and actually commenced a new growth sooner than those set six days earlier. The subsequent treatment of the two fields was as nearly identical as possible; but the second field yielded over 100 bushels per acre more fruit than the first and it was so superior in quality that, sold by the same man in the same market, it brought an average of nine cents per package more money. We were familiar with the fields and their treatment, and know of no reason for the difference in results except the check that one lot received at transplanting. All our experience with Tomatoes convinces us that the first and great essential to the best results is a steady constant growth from start to finish, but more especially when the plant is young. This

2518. The modern type of large, round, "smooth" Tomato.

leads to a method of culture which differs somewhat from that usually recommended. We plant the seed in flats placed in a greenhouse or hotbed, some forty to fifty days before we think the plant can be set in the field without danger of frost, or what is quite as bad, a cold, dry wind-storm. As soon as the plants can be handled (which ought to be ten or twelve days from the sowing of the seed), we transplant into other flats or into coldframes, setting them 2 to 4 inches apart according to the space available and the desired size of the plants when set in the field. We have never failed to get better results from plants which had been transplanted but once (and that when very small) and had been kept in constant growth, than from those which were started earlier and kept of a practical size for setting in the field by repeated transplanting and pruning.

We aim to give the young plants light, heat, water, and above all air, in such proportions as to secure a constant and steady growth, forming stocky, vigorous plants able to stand erect when set in the field, even if they are a little wilted. A plant which has once bowed its head suffers from it forever.



2519. A prolific Tomato, the result of training to a single stem.

For Tomatoes we prefer a field that has been made rich by fertilization in previous years, but if manure is used we aim to have it thoroughly worked into the soil. There is no crop in which this is of greater importance than with Tomatoes. If we have to depend upon commercial fertilizers we select those comparatively rich in nitrogen and potash, and work in two-thirds of it just before setting the plants and the balance some four or five weeks later. We prepare the field by plowing as early as it can be worked, and repeated replowing or deep working until, at the time the plants are set, it is a deep bed of mellow, friable soil. We begin cultivating the day after the plants are set, running the cultivator as deep as possible, and go through again every two or three days, as long as the plants will permit; but we aim to make each cultivation shallower than the preceding one until it becomes a mere stirring of the surface soil.

When quantity and quality are of little importance compared with earliness, the best results are obtained by a method almost the opposite of that given above. The seed is sown very early so that, though growth is kept in check by crowding and scarcity of water, the plants have set the first cluster of fruit, which is sometimes nearly full grown by the time danger of severe freezing is past, and the plants are then set in the field much earlier than recommended for general crop. In setting, furrows are opened running east and west and the plants set in slanting to the south, so that the fruit is just above the surface, with a bank of earth on the north side, and the roots are no more than normal depth. So treated, the plant will ripen the fruit already set very early, but the subsequent crop is of very little value.

When quality is of first importance, staking and pruning is essential, as in this way much better fruit can be grown than can be produced on unpruned vines allowed to trail on the ground, particularly if the soil be at all cold. When the plants are to be staked and pruned they may be set as close as 30–40 inches apart. We have obtained the best results from the use of a single stake, some 2 inches square and 5 or 6 feet long, to each plant. As soon as the plant shows its first cluster of flowers it divides, and the two branches are allowed to grow, being tied to the stake as necessary; all branches starting below the division are cut or pulled off, and any above are cut off just beyond the first leaf or cluster of blossoms. Most of the fruit produced in the Gulf states for shipment north is grown in this way.

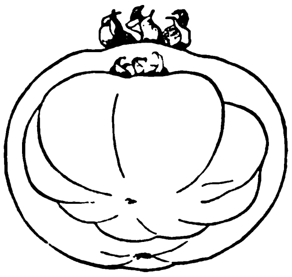
For market or for canning and pickling, quantity and quality of crop and cheap production are of prime importance, and the best results are secured by following the general cultural directions as just given. As the gathering of the crop is one great element of its cost, we have found it profitable to set 15 to 20 rows and then omit one to form a driveway, at the same time omitting every sixth or eighth plant in the row to form a cross-walk. This facilitates the distribution of the empty, and the collection of the full crates, and enables one to gather the fruit with less injury to the vines; consequently one secures nearly as much marketable fruit, particularly if it is gathered green for pickling, as if the entire space was covered.

Although the Tomato has been in cultivation a much shorter time than most of our garden vegetables, there have been developed a great many varieties, differing materially in habit of vine, size, form and color of fruit as well as other qualities; and these differences are so divergent, and individual taste and the demands of different markets so varied, that it is difficult to classify the varieties or arrange them in order of merit.

The extra-early sorts are of two types, one represented by Early Minnesota, with a vigorous vine producing in abundance large clusters of small, round, smooth fruits which ripen early but are too small for market; the other represented by the Atlantic Prize, in which the vine is short-lived, lacking in vigor, and produces very early-ripening fruit, too rough to be salable after the smoother sorts reach the market.

Of varieties for a general crop there are quite a number, varying greatly in type and quality, from the Optimus of medium size, perfect form, fine flavor and brilliant vermilion-red color, through the larger Favorite and Matchless, to the perfect-shaped, large-sized, late-ripening Stone; or if one prefers the purple-red, from the Acme through the Beauty to the later Buckeye State.

If one prefers the dwarf-growing plants, we have the purple-fruited Dwarf Champion or the fine-flavored and beautiful red Quarter Century. For special purposes and to meet individual tastes we have the immense and solid Ponderosa and the Honor Bright, which can be

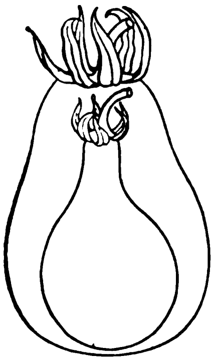


2520. The old-time and new-time forms of Tomatoes—the angular and the "smooth."

shipped long distances almost as readily and safely as the apple and more so than the peach, and which, picked and stored on shelves, will prolong the season of fresh Tomatoes from one's own garden till Christmas time. And to please the eye we have the Golden Queen, of clear yellow with a beautiful red cheek, or the White Apple—nearly white—or the Peach, covered with bloom and as beautiful in color as a peach. For pickling we have the Red Plum and Yellow Plum, the Red Pear-Shaped and the Yellow Pear-Shaped, the Red Cherry and the Yellow Cherry, and the cherry-like exquisite-flavored Burbank's Preserving. Every season there are new and more or less distinct varieties added to the lists; and very truly of the making of new varieties of Tomato, like the making of books, there is no end.

W. M. Tracy.

Tomatoes Under General Field Conditions.—Tomatoes should be started in hotbeds. To make the beds, select a sheltered place on the south side of a bank or erect some shelter on the north side from where the hotbed is to be made. Dig a hole about a foot deep, 8 feet wide and as long as needed; 18 feet long will give room enough to grow plants for twelve acres of Tomatoes. Use fresh stable manure; cart it out in a pile and let it lay three or four days, then work it over until it gets good and hot, then put it into the hole prepared for it, 8 x 18 feet, about 18 inches thick. Then place the frame, 6 x 16 feet, on the manure; that will leave one foot manure outside of the frame; by this means the heat will be just as great at the edge of the bed as it is in the middle. Then place 4 or 5 inches of dirt on the manure and let it lie for a couple of days to allow the dirt to get warm. The sash is put on as soon as the dirt is placed. When the dirt is warm, rake it over to get it nice and fine, then sow the seed in drills which are made about 2 inches apart by a marker. Sow the seed by hand; the sash is then put on close to the dirt; at the lower end of the bed the frame is made 3 inches higher at the end next to the bank so the water will run off; the bed is banked up all around so no cold can get in. In this way the bed will be kept warm and the seed will soon come up. After the plants are up nicely, they will need some air that they may become hardened and grow stocky. Ventilating can be done by raising the bottom of the sash and putting a block under them while the sun is hot; but do not neglect to lower them at night. When the plants are four or five weeks old, and about 2 inches high, transplant the first into a bed that has a little warm manure in the bottom and 4–6 inches of dirt on top. Use sash over this first bed, as the weather is quite cold at night. Do this in order to get the early plants in the field. Transplant the remainder into coldframes and use coverings or shutters made of boards. Transplant all in rows 6 inches apart and 2 inches in the row. Keep them in these beds until planted in the open fields. When there is a frost in the morning and plants are large, take off the covering early in the morning that the frosty air may harden the plants while they are in the bed. Sometimes the plants are in blossom before they can be set in the fields. Never pinch a plant back. A good-sized plant is from 4–6 inches high and stocky; the stronger the plant the earlier will be the crop. The main point is to get the plant strong before it is set in the field, then it will not stop growing, while a slender, weak plant will not start to grow as soon. Transplanting the plants from the sowing bed into the cold beds helps the plants, and they will produce earlier fruit than those set in the fields from the hotbeds. Take them up with a trowel that all of the dirt possible may go with them from the bed into the field. In case the ground is dry, take a large box with clay in it and make a regular mush, dip the plant into it, then put the plant in the box. One can leave them there for a day or two before setting them in the field.



2521. Two forms of the pear Tomato.

Prepare the ground about the same way that farmers prepare corn ground. Have it well harrowed, then mark it off 4 x 6 or 5 x 6, and when the ground is very rich 6 x 6 feet, and set the plant in the cross. Use the hands to fill the dirt around the plant. Set the plants that are transplanted under sash first, as they are the oldest and strongest. These can be risked in the field first; then fill that bed with plants again, as plants may be needed for replanting in case cutworms or other causes destroy some of the first setting.

2522. A pear-shaped type of Tomato.

Never put manure under the plants set in the field. The best way to manure the ground is a year before, for some other crop, such as cabbage, potatoes or pickles; then you can grow Tomatoes several years after. Never put Tomatoes in ground prepared with fresh manure, for the manure burns the roots and causes trouble, and the flavor of the Tomatoes is not so good. As soon as a field of Tomatoes is planted, go over the area with hoes and draw up some soil to the plant, and fill in around the plant with earth so it will not get dry into the roots. After the plants begin to take root, go through the field both ways with the cultivator, and keep this up during the season. One cannot cultivate them too much. Some farmers think that because there are no weeds growing around the plants they need very little cultivating, but this is a mistake. When the season is dry they need more cultivation in order to keep up the moisture.

Half-bushel baskets are very useful in picking Tomatoes. Our own practice is to take about six rows in a piece and throw the vines of a row around so that we can drive a team through the field. If the rows are 6 feet apart a team can go through without destroying many Tomatoes. In that way one can pick more Tomatoes in a short time because he does not have to carry them so far. Have boxes alongside where the team will go and the Tomatoes are carried to these bushel boxes, and when the team comes are loaded and driven to the factory. Picking is done mostly by children. A man is with them who keeps account of what they pick and gives them instructions in picking.

H. J. Heinz Co.

Tomato Culture in the South.—The Tomato is one of the most capricious of market-garden vegetables. It is of greater relative importance in the South than in the North. Essentials of habit and cultivation do not materially differ in either section. While by no means a gross feeder, the plant demands a fairly good soil, light, porous and well drained, and is generously responsive to judicious fertilizing, though acutely sensitive to the slightest variations of soil and climate. Underfertilized it is unprofitable; too liberally manured, especially with nitrogenous matter, it runs to vine at the expense of fruit and is subject to excessive inroads from bacterial and fungous diseases. Similar results follow from wet seasons or too heavy soil, while drought or insufficient nourishment cut short the harvest. To steer a middle course between these extremes is difficult. It is, on the whole, safer to underfertilize than to overfeed—to select a moderately dry, sandy loam, well manured the last season, and with but a light application of fertilizer, or none at all for the present crop—to risk underproduction rather than invite overgrowth of vine, fungous maladies, loss of foliage and decay of fruit.

The normal fertilizer formula approximates that for the potato, though a smaller percentage of nitrogen will suffice—say 3 per cent nitrogen, 9 per cent phosphoric acid and 7 per cent potash. This would be met by a compound of: Nitrate of soda, 400 lbs.; high grade (14 per cent) superphosphate, 1,320 lbs.; muriate (or sulfate) of potash, 280 lbs.; total, 2,000 lbs. This may be used to the amount of 1,000 lbs. per acre with safety on a well-selected soil if applied sufficiently early in the season. Such an application should produce a yield of 300 bushels per acre in a normal season with any of the better standard varieties.

Varieties.—All things considered, the following short list presents for the South the best of half a century's effort in development: Crimson Cushion, Stone, Ponderosa, Freedom, Acme, Trophy, Paragon and Perfection. The medium-sized, smooth, round, red, uniform, solid fruit represented by Stone and Acme, and of which Crimson Cushion is perhaps the choicest and most conspicuous example, presents an almost perfect type, of which one can ask little more than that its present standard be permanently maintained. Yet local experience and preference must ever differ with this as with all other soil products.

For slicing, Golden Queen or Yellow Acme is incomparable, but it is valueless for cooking by reason of the muddy tint developed thereby. Fruit of the Ponderosa type is too large, gross and frequently too unsymmetrical for successful shipping; it finds a readier sale in local markets. Extra earliness in maturity seems to be more or less a chimera, little real difference appearing (on careful test) between most varieties. Early ripening is rather a matter of soil, manipulation and local environment than a fixed habit.

Color is apparently a secondary consideration, tastes in this particular varying greatly. Some markets prefer the crimson shade of the Acme type, while others demand the purple tinge of the Mikado.

Vigor of growth, productiveness and shipping quality seem the three most important requisites—size, even, yielding to them in importance. Oversized fruit, indeed, is almost as serious a defect as undersized. The following would probably represent the best scale for an ideal Tomato at the South, though differing somewhat from that generally recognized:

	Per cent
Vigor (covering freedom from disease)	20
Productiveness	16
Shipping quality	14
Shape	12
Size	11
Earliness	10
Color	8
Flavor	5
Cooking quality	4
	100

Cultivation.—Whether grown on a large or small scale, the young plants are started under glass from January to March, according to isotherm, and in about 30 days from the seed are ready for "pricking out" or transplanting—to open ground in the lower latitudes, farther north into boxes or "Neponset" pots. The latter, constructed of paper, admit of handling without rupturing the root system when permanently transplanted some 30 days later.

The land, when the business is conducted on a large scale, may be prepared as for cotton by "laying off" after breaking and fining, and then bedding on the fertilizer drilled in continuous rows—though compost is usually distributed "in the hill." For garden cultivation the latter plan is strongly recommended, though broadcasting is preferable for limited areas. A shovelful or so of well-rotted stable manure to each hill, reinforced by a top-dressing of superphosphate in early spring, gives excellent results.

Distance naturally varies with character of soil—sometimes with variety of Tomato—and depends, also, on the mode of training. Where no supports are used 6 x 4 ft. is not too great. When trellised with 3 ft. posts, at intervals, and one strand of No. 12 wire, either 6 x 4 or 6 x 3 will do, and when trained to 5 ft. single stakes, 5 x 3 ft.

The crop should be rapidly worked through the season with either cultivators or "22-inch heel scrapes"—at first in both directions, and afterwards, as the vines spread, following the wide row only. Of course with trellises cross-plowing is impossible.

Under either system pinching back weak or inconsequent laterals is necessary. All lower laterals when stake-training is employed must be pruned until a main stem is established, which is trained spirally around the stake and secured with raffia, after which laterals are still shortened from time to time, as occasion requires. This is an ideal, and also a practical system, and though necessarily the most expensive, will generally justify its use by the results. With the trellis system two or three stems are allowed to grow, although the plant is sometimes restricted to one stem for "fancy" results. When no support is used only the more stocky and fungus-resisting varieties should be planted and severely pruned while young, to form, as far as possible, an upright, rigid growth. This is the most common method and probably the most profitable also, when land is cheap and the grower is not readily discouraged by damp and decay and is vigorous and determined in the use of the spray-pump. It is certainly the most economical form of cultivation everywhere, at least to outward appearance.

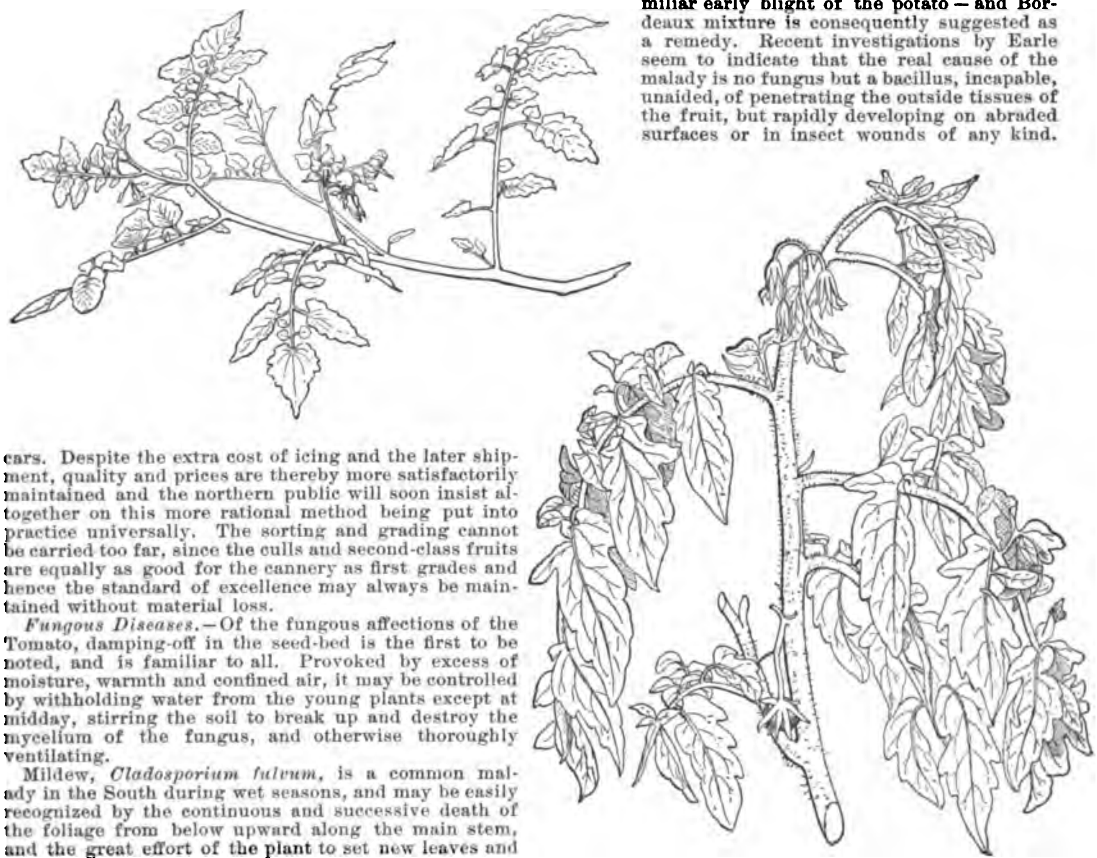
Without his spray-cart and fungicide the tomato-grower is lost—and knows it! The sprayer has hence become an invariable and indispensable adjunct to the truck farm, by means of which most of the fungous and bacteroid affections of the plant may be, if not altogether prevented, at least held in hand and damage reduced to a minimum. But it must be kept going resolutely and continuously from the first—the earlier sprayings to consist of an admixture of 4 ounces Paris green to each barrel of Bordeaux mixture to hold in check insect depredators, later sprayings to be made with Bordeaux only.

Second Crop.—A peculiar advantage of the Tomato over other transplanted truck crops is its ready disposition to grow from cuttings, thus obviating the necessity for re-seeding for a second or fall crop, as with the cabbage The cuttings afforded by the pruned laterals strike root vigorously, and thus afford a ready means for filling vacancies in the plat immediately upon their occurrence; and, since the plants from cuttings begin to fruit as soon as they start growth, a continuous succession may be obtained from early summer until the plants are cut short by frost in the fall—an economic consideration of vast importance.

Marketing.—While no particular state or section of the South altogether monopolizes the northern markets, and many trucking centers from lower Texas and Florida to Norfolk and Memphis successively forward their shipments in greater or less quantity, the Florida crop is probably the earliest, largest and best known, though heavy shipments are made to western cities from Louisiana and Mississippi, while the middle and eastern states are supplied, after the Florida shipments have ceased, by the truckers of Savannah, Charleston, Wilmington and Norfolk in turn.

The methods of packing and shipment are as many and as diverse as the local centers of production. The Florida crop, dominating the very early market, is usually shipped stark green, each fruit paper-wrapped in the regular "six-basket carrier" used for Georgia peaches, and forwarded by "ventilated fast freight." This meets the early spring demand, but the fruit ripens unevenly and is frequently unsalable at the expected fancy figures on account of its appearance.

A growing tendency has been lately manifested to ship as the fruit is coloring, after careful and systematic grading, in "four-basket carriers" by refrigerator cars. Despite the extra cost of icing and the later shipment, quality and prices are thereby more satisfactorily maintained and the northern public will soon insist altogether on this more rational method being put into practice universally. The sorting and grading cannot be carried too far, since the culls and second-class fruits are equally as good for the cannery as first grades and hence the standard of excellence may always be maintained without material loss.



2523. Foliage of the two cultivated species of Tomato. Lycopersicum pimpinellifolium—Currant Tomato—above; L. esculentum—common Tomato—below. (× ½.)

Fungous Diseases.—Of the fungous affections of the Tomato, damping-off in the seed-bed is the first to be noted, and is familiar to all. Provoked by excess of moisture, warmth and confined air, it may be controlled by withholding water from the young plants except at midday, stirring the soil to break up and destroy the mycelium of the fungus, and otherwise thoroughly ventilating.

Mildew, *Cladosporium fulvum*, is a common malady in the South during wet seasons, and may be easily recognized by the continuous and successive death of the foliage from below upward along the main stem, and the great effort of the plant to set new leaves and branches above, thereby maintaining its life at the expense of production. Steady spraying with Bordeaux mixture is the remedy.

Florida blight, an undetermined species of *Sclerotium*, is less common, though sometimes quite serious. It produces a wilted appearance in the plant somewhat resembling that caused by the "bacterial blight," and like it generally causes death. The peculiarity of this fungus consists in the fact that the greater portion of its life is passed under ground and it is hence unaffected by fungicides applied to the foliage. Even when applied to the surface of the ground beneath the plant Bordeaux mixture is of little value, since the precipitate formed by the copper salt in suspension is more or less arrested or strained out by the soil as the liquid filters through. The ammoniacal solution of copper carbonate, and eau celeste, are not liable to this objection, and may be used as remedies with fairly satisfactory results.

Leaf curl, œdema, is also well known and while it seldom, if ever, completely destroys the plant, yet it greatly reduces its productiveness and is all the more insidious from the fact that it frequently escapes notice until it reaches an advanced stage. It is a form of vegetable dropsy due to too much soil moisture, unbalanced food formulas or excessive pruning—one or all. Cessation of pruning followed by deep cultivation will arrest the malady, to a great extent, as the plants will thus be given an opportunity to set foliage, thereby affording breathing surface sufficient to transpire or pass off the surplus moisture. The feeding power of the roots should be reduced and evaporation stimulated from the soil. Possibly a light application of superphosphate at time of cultivation would also prove beneficial.

Black rot, or blossom end rot, a widespread affection causing great loss of fruit, and quite familiar to all, seems to have long been erroneously ascribed solely to one of the forms of *Macrosporium*—the familiar early blight of the potato—and Bordeaux mixture is consequently suggested as a remedy. Recent investigations by Earle seem to indicate that the real cause of the malady is no fungus but a bacillus, incapable, unaided, of penetrating the outside tissues of the fruit, but rapidly developing on abraded surfaces or in insect wounds of any kind. The boll worm appears to be an active agent in its distribution, while thrips and other wandering insects largely assist in spreading or disseminating the bacilli. Hence fungicides would prove of little avail in controlling the bacterial agencies, which seem to work in conjunction with the fungus heretofore regarded as alone responsible for this malady. We must therefore look for its complete subjugation only to those preventive measures which have been found efficacious in other forms of bacterial disease in plants. These are detailed in the next paragraph, which covers the worst malady known to the trucker.

Bacterial blight, *Bacillus solanacearum*, is by far the most difficult to control of all the affections of the Tomato. When this peculiar form of wilt puts in an appearance the grower is always thrown into more or less of a panic. The malady progresses rapidly. The foliage soon yellows and shrivels, the stems parch and contract, and death follows swiftly. As with most bacterial diseases, an effective remedy is yet to be found. At best, preventive measures only can be adopted. Since it has been found that certain insects—among them the Colorado beetle—assist in disseminating the bacilli causing the trouble it is evident that all leaf-devouring insect pests should, as a primary procedure, be eradicated, as far as possible, from the Tomato plot. This at once suggests the importance of crop rotation as a second step, and thereafter, in sequence, the destruction of affected vines and contiguous vegetable matter, the selection of areas not recently planted with solanaceous crops, and finally the importation of seed (for all solanaceous plants as well as Tomatoes) from districts known to be exempt from the blight.

Insect Pests.—While these are relatively numerous, their ravages are much less of a menace to the grower than either the fungous or the bacterial maladies. Only the more important are here mentioned.

2524. Stake-trained Tomato.

First, the boll worm, *Heliothis armigera*. As the problem of the damage done by this insect is of almost equal interest to the cotton planter and the Tomato trucker, the corngrower, too, being largely concerned, it might well be left in their hands for solution, but for the fact that the loss to the trucker is not confined to the direct depredation of the worm itself, but a pathway is thereby opened to the subsequent inroads of the blight bacillus, as stated. It is on this account that the trucker's interest in the "boll worm" is paramount. Unfortunately no adequate remedy beyond hand-picking, the use of corn as a "trap-plant" and the destruction of wormy fruit has ever been suggested.

Of the various cut worms and wire worms almost the same might be said, omitting the interest of the cotton planter. Remedies are equally illusive. Except the stereotyped "sunrise worm hunt" with a bit of shingle, and cabbage leaves or dough poisoned with Paris green and deposited at night about the plat, nothing of value has ever been suggested.

Hand-picking for the great, green, sluggish tobacco worms, *Phlegethontius Carolinus*, usually proves effective, in combination with the process of poisoning followed by tobacco growers by means of a solution of cobalt and sugar deposited each afternoon, at dusk, in the corolla of the Jimpson weed, *Datura Stramonium*, which the tobacco moth frequents.

The flea beetle, *Phyllotreta vittata*, pinholing the foliage in clammy, cloudy weather and thereby assisting the inroads of fungi and bacilli, is sometimes repelled though not destroyed by Bordeaux mixture.

Nematode galls, Fig. 2144, p. 1545, caused by the "vinegar eels," *Heterodera radicicola*, which affect cotton, peas and certain other garden plants, frequently do much damage to the Tomato. They can be avoided only by rotation of area and preventing the contiguity of any of their host plants—particularly cowpeas.

After all, the chief injury wrought by insects upon the Tomato consists not so much in direct depredation as in the incidental transfer of bacterial germs through their agency. Boll worms, thrips, Colorado and flea beetles, and other forms relatively innocuous in themselves, become, for this reason, a serious menace. Were their complete extinguishment possible, the commercial prospects and possibilities of the Tomato plant would be infinitely improved. HUGH N. STARNES.

Tomato Growing Under Glass.—The Tomato is now one of the most popular vegetable crops for forcing. It is grown to a considerable extent near most of the large eastern cities. Very often it is grown in connection with carnations or other plants. The houses may be used for carnations during the winter season and for Tomatoes in late winter and early spring when the outside temperature becomes warmer. In many cases, however, houses are used almost exclusively for Tomato growing. The forced crop usually comes into market during holidays and runs until May or even June. The winter crop is usually relatively light and the Tomatoes small. The crop that matures when the days are long, from April on, is much heavier and the fruits are considerably larger. Nearly all the heavy yields and large specimens that are reported in the public press are secured in the later crops.

Many Tomato growers aim to have crops from two sets of plants. One set of plants produces a crop in midwinter or somewhat later, and the other set comes into bearing in April or May. These crops may be raised in different houses, succeeding other plants. If they are grown in boxes, however, they may be handled in the same house, the pots for the second crop being set between those of the first crop before that crop is off. In many instances, however, only one crop is grown; that is to say, the effort is made to secure a more or less continuous picking from one set of plants running over a period of two months or more.

The Tomato requires a uniform and high temperature and is very subject to diseases and difficulties when grown under glass. There are many risks in the business of Tomato growing in winter. It is probable that there is no money to be made from it when the price falls below thirty cents per pound, and perhaps the limit of profit, taking all things into consideration, is not much below forty cents.

Tomatoes are now usually grown on benches or in solid beds, preferably the former. Sometimes they are grown in boxes 10 or 12 inches square or in 10- or 12-inch pots, but greater care is exercised to grow them in this way and the expense is also increased. Plants may be raised either from cuttings or from seeds. Seedlings are usually preferred in this country. It requires from four to five months to secure ripe Tomatoes after the seeds are sown. The young plants are usually started in flats and are then transplanted to other flats or, preferably, to pots. They should be stocky and well grown and about 6 or 8 inches high when they are placed in the beds.

Sometimes the old plants are bent down at the base and one or two feet of the stem covered with earth; the top then renews itself, particularly if cut back, and a new crop of fruit is produced. Plants can be kept in bearing for two seasons. Healthier plants and better results are usually secured, however, when new plants are used for each succeeding crop, although time may be saved by the laying-down process.

As grown in this country winter tomato plants are usually trained to a single stem, being supported by a cord that runs from near the base of the plant to a support overhead. In this system of training the plants may stand 2 feet apart each way or even less. The side shoots are pinched out as fast as they appear, the main central shoot being allowed to grow. It is loosely tied to a cord or wire as it ascends. Usually the main stem is stopped when it reaches about 5 feet in height. Some persons prefer to start 3 to 5 stems from near the crown of the plant and to train them fan-shape. When this is done the plants should stand from 2 to 3 feet apart

2525. A strand of winter Tomato, showing the clusters supported by slings.

either way. This system is seldom used in American commercial Tomato growing, however.

The soil should be much like that which is adapted to the growing of Tomatoes out of doors. It should be well enriched with old short manure and also with some commercial fertilizer which is relatively rich in the mineral elements. Care should be exercised that the soil is not secured from a Tomato field, for in that case diseases are likely to be brought into the house. Every effort should be employed to cause the plants to grow continuously. Plants that become root-bound or yellow and pinched cannot be expected to give good results.

HOEING THE GROUND.

PLOW DRAWN BY MEN.

PLOW DRAWN BY OXEN.

2526. Sculptures from a Theban tomb "of the 18th or the beginning of the 19th dynasty."

From Daubeny's "Lectures on Roman Husbandry." "The plough itself is nothing more than a modification of the hoe, which was first dragged along the ground by manual labor, before the force of oxen was substituted." (See *Tools*, page 1820.)

Some bottom-heat should be applied. If the soil is as shallow as 4 inches, care should be taken that pipes are not too close to the bottom of the bench or that the heat is not too great. From 5 to 6 inches is a better depth for soil on Tomato benches, and the pipes for carrying steam should be several inches beneath the bottom. The temperature of the house at night should not fall below 60°, although a lower temperature than this, providing the house is dry and the plants are not growing very rapidly, may result in no appreciable harm. It is better, however, to maintain a temperature of 65° at night. The day temperature should run from 75 to 80°. The house should have an abundance of light and should be high enough only to allow the plants to have free head-room.

The Tomato plant is very likely to grow too rapidly when it is given too much water and the temperature is too high. This is particularly true in the dull cloudy days of midwinter. The plant then fills with moisture, becomes soft and flabby and is likely to develop the œdema, or dropsy. This disease manifests itself in brown elevations on the stems and in the curling of the leaves. When a plant is once seriously affected it is worthless. The preventive is to keep the houses well ventilated and relatively dry in spells of dark weather. This caution applies particularly to the duller and damper parts of the house.

The Tomato flower needs hand-pollination to enable it to set fruit. The pollen will ordinarily discharge readily if the flower is jarred quickly at midday when the sun is shining and the house is dry. When the flowers are ready for pollination a bright day should be looked for and the house should not be watered that morning. The pollen is jarred into a spoon or a watch-glass, and into this pollen the protruding stigma of the flowers is rubbed. It is necessary to apply an abundance of pollen in order to secure large and well-formed fruits. The pollinating should be done freely and with great thoroughness, as upon this operation depends the chance of securing a full and good crop. One can rarely expect to secure from a whole house an average of more than 3 to 4 pounds of fruit to a single plant for the winter crop when the plants are trained to a single stem. Similar plants fruited in April or May, however, may produce considerably more than this. As soon as the fruit clusters begin to get heavy, they should be supported by cords secured to the main stem (Fig. 2525).

Many varieties of Tomatoes force with ease. There are few which seem to be special forcing varieties. Usually a Tomato of medium rather than of large size and one that is rounded and with few creases or angles is to be preferred. The varieties of Tomatoes that are in favor for forcing are constantly changing and it is not advisable to give a list here.

The Tomato is beset by several difficulties when grown under glass. One of the most serious is the root-gall, which is due to a nematode worm. In the northern states where the soil may be frozen there should be little difficulty with this pest. After the crop is off in early summer all the soil should be removed from the benches and the boards should be thoroughly washed with lye. The new soil should be such as has been thoroughly frozen. The practice of mixing old forcing-house soil with the new soil is very likely to perpetuate any root-gall difficulty that may have been introduced into the house. When once plants are affected with the root-gall they cannot be saved. The Tomato rust, which is characterized by fungous spore-patches on the under sides of the leaves, may be held in check by spraying with Bordeaux mixture or other fungicide. There are several forms of blight which are apparently bacterial troubles. These seem to follow unsanitary conditions of the house, as too close temperature, too little light, too much moisture at the root, and the like. They are characterized by various degrees of curling and blackening of the foliage and young growth. There is no remedy. Infected plants should be destroyed and, as a safeguard, the soil in which they grow should not be used again in the house. The rot of the fruit is often serious in Tomato houses. The cause of the trouble is not definitely known. After the rot has proceeded to a certain stage, filamentous fungi develop, and these were formerly considered to be the cause of the trouble. The only remedy so far known for rot in houses is to give attention to the general sanitary conditions of the place and to pick off the injured fruits as fast as the disease develops. L. H. B.

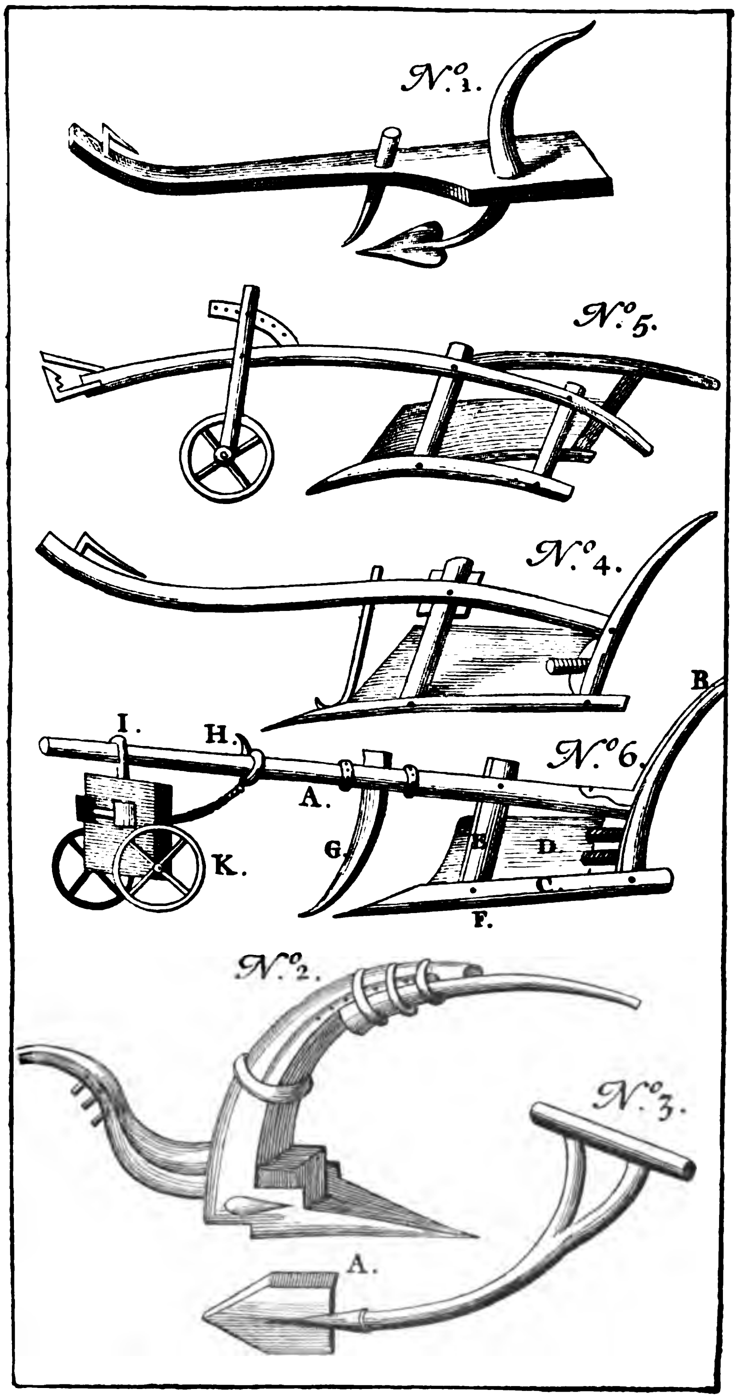
TOMATO. **Husk T.** is *Physalis pubescens.* **Strawberry T.** is *Physalis Alkekengi* and *pubescens.*

TOMATO, TREE. *Cyphomandra.*

TOMMASÍNIA (Tommasini, a magistrate and naturalist of Trieste). *Umbelliferæ.* Two species of herbs allied to Peucedanum and Angelica. Bentham and Hooker attach it to Peucedanum. In the breaking up of that genus (see *Peucedanum*), this group would seem to be best treated as a distinct genus, following Koch, Boissier and others. It has the habit of Angelica. From Peucedanum it differs chiefly in having the petals involute on the margin. Involucre none; involucel many-leaved; margin of carpels dilated: fls. somewhat polygamous. One species, **T. verticillàris**, Bertol. (*Peucédanum verticillàre*, Koch. *Angélica verticillàre*, Linn.), is advertised in this country as a lawn plant. It is a hardy perennial, about 1 ft. tall: lvs. with many small yellow-green flowers, 3-pinnate, the leaflets ovate, acute-serrate and the lateral ones often 2-lobed and the terminal one 3-lobed, the petiole much dilated at base. Piedmont region, S. Europe. L. H. B.

TOOART TREE. *Eucalyptus gomphocephala.*

TOOLS. The American farmer is known by his tools and machinery. Labor costs much and land costs little. The



2527. Ancient plows, reproduced from Bradley's "Survey of the Ancient Husbandry and Gardening," 1725. Herewith is Bradley's explanation:

"No. 1. Figure of an ancient Plough, supposed to be used about the Time of the *Romans.*

"No. 2. Figure of a *Spanish* Plough, which some suppose preserves somewhat of the Manner of the *Roman* Plough, only alter'd to be drawn by one Horse, instead of a Yoke of Oxen. 'Tis said that the Husbandmen in *Spain*, will plough two or three Acres of light Land in a Day with this Plough.

"No. 3. The common Shoulder Plough or best Plough, used in several Parts of *England*, for cutting or breaking the Surface of Grass Grounds, or Heath Lands; 'tis push'd along by one Man: sometimes cutting the Turf half an Inch thick, sometimes an Inch or two. At A is an Iron turn'd up with a sharp Edge, to cut the Turff from the rest of the green Sward.

"No. 4. Is a Figure of the common Dray Plough, which is good to be used for miery Clays in Winter: but is not so proper to be used in Clays when they are hard.

"No. 5. The Figure of a singl'd Wheel'd Plough, used in *Sussex.*

"No. 6. The Figure of the *Hertfordshire* Wheel Plough, which is of the easiest Draught; proper for any Grounds, except miery Clays, which are apt to clogg the Wheels. The several Parts of this Plough, being understood, will explain to us the Use of the other Ploughs. A is the plough Beam, B the Handle, Tail, Stilts, or Staves, C the Neck, or Share Beam, D the Earth Board, Mould Board, Furrow Board, Shield Board, E the Sheath, F the Share Iron, G the Coulter, H the Plough Pin and Collar Links, I the Plough Pillow, K the Wheels."

American is inventive. The result is that there is a tool to expedite and lighten almost every labor. The effort of each man is multiplied. Not only are the American tools numerous and adapted to almost every agricultural labor, but they are trim, light and comely in design.

A tool is properly a hand implement, used to facilitate mere manual labor. A machine is a contrivance, usually more elaborate, that multiplies and transmits power or motion. Yet tools and machines merge so completely that it is impossible to make a definite category of one or the other. The word implement is more generic, and applies to any intermediary device by means of which a man accomplishes a given work. The phrase "agricultural implements," as used by tradesmen, usually refers to both tools and machines. In general discussions the word tool is used somewhat indefinitely, as in this sketch; but even then it does not include complicated machinery.

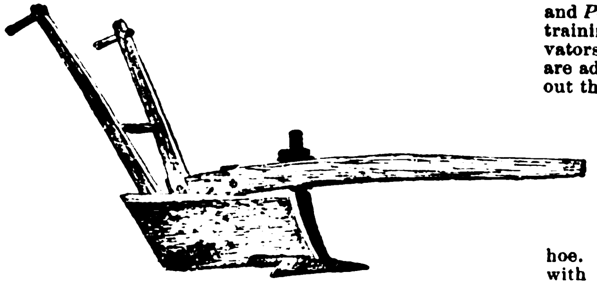
2530. The perfected American plow.

The tools used by horticulturists can be thrown into four general categories:

1. Tools for tilling the land, as plows, harrows, rollers, cultivators, weeders, hoes, rakes. See *Tillage*.
2. Tools to facilitate various handwork, as seed-sowers, transplanters, markers, pruning implements, and most greenhouse devices.
3. Tools or machines to facilitate the destruction of insects and fungi, as fumigators, syringes, spraying devices. See *Spraying, Insecticides, Fungicides*.
4. Tools or vehicles for transporting, as carts, harrows.

In the multiplicity of tools, one is often at a loss what to purchase. The buyer should have a definite idea of the kind of labor that he needs to have performed and he should then consider how well adapted the tool may be to perform that labor. Once purchased, the tools should be cared for. A tool shed or room is the greatest convenience and often the greatest economy. Labor is expedited and annoyance saved if each tool has its place. Every farm or garden should be provided with a room that can be warmed in cold weather, in which repairs can be made on tools and machinery. No general farm barn is complete without such a room. The care of tools not only contributes to the longevity and usefulness of the implements themselves, but it sets distinct ideals before the farmer and thereby is a means of educating him. The greater the variety and the better the quality of the tools the more alert the user of them is likely to be. One should look up the new ideas in tools each year as he does in markets or crops. The advertising pages of rural papers are suggestive in this direction.

2529. An European type of plow, still used in its improved forms.



2528. An early Yankee plow, made of wood and the moldboard protected by iron nailed on. After Roberts.

The original tool for opening or tilling the ground appears to have been a forked or crotched stick, one prong of which was used as a handle and the other as a cleaving instrument. From this the hoe and the plow appear to have developed. Fig. 2526. The hoe and the plow are still the fundamental or primary tillage tools, one being for hand-work essentially what the other is for team-work. As the philosophy of tillage has come to be better understood, these tools have been greatly modified and varied. It is surprising to know that the plow was not perfected until within a century. It is doubtful if the invention of any of the most important machines of modern times has really meant so much for the welfare of the race as the birth of this humble implement. To many persons is ascribed the credit of the invention of the modern plow, for the implement seems to have originated independently in different countries, and even in America there are various contestants for the honor. Thomas Jefferson, Charles Newbold, David Peacock, and others have received the honor. There is reason for ascribing the modern type of plow to Jethro Wood, of Scipio, Cayuga county, New York. The years 1814 and 1819 are the dates of his most important patents, although the latter is usually regarded as the natal day of the implement. Wood was born in Massachusetts in 1774 and died in 1845 or 1846. (See "Jethro Wood, Inventor of the Modern Plow," by Frank Gilbert, Chicago, 1882.) The study of plows is a curious and profitable undertaking, and one that still needs to be prosecuted. Some of the forms of plows, ancient and modern, are shown in Figs. 2527–30.

The large-area farming of North America and the apprehension of the principles that underlie tillage have resulted in the invention of a large number of surface-working tillage tools. These inventions are particularly important in orcharding, as they enable the grower to maintain the necessary surface mulch (see *Tillage* and *Pomology*) with a small amount of labor and without training the trees too high. There are now many cultivators and harrows which cover a wide swath and which are adapted to the light stirring of the surface soil without the turning of furrows and the ridging of the land. Fig. 2531. One who is contemplating a serious study of tillage tools should familiarize himself with the inventions of Jethro Tull, before the middle of the eighteenth century. Tull devised implements to facilitate the tillage of plants when they were growing in the field.

In hand-tillage tools the greatest recent advancement is in the development of the wheel hoe. Fig. 2532. This light and simple tool, usually with adjustable blades, performs the labor of many sets of fingers and does the work more effectively so far as tillage is concerned. It also enforces better initial preparation of the land in order that it may do its work more perfectly; and this remark will also apply to the modern seed-sowers. Fig. 2533.

Unfortunately, there is no recent American book that discusses the principles underlying the application of farm tools and machinery. Practically, our only sustained effort in that direction is Thomas' "Farm Implements and Machinery," 1859 and 1869. Useful handbooks illustrating various farm devices are "Farm Conveniences" and Martin's "Farm Appliances," both published by the Orange Judd Company. L. H. B.

2531. Two types of tools for preparing the surface soil. The spike-tooth and spring-tooth harrows.

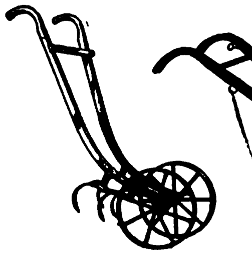
TOOTHACHE TREE. See *Xanthoxylum*.

TOOTHWORT. English-made name for *Dentaria*.

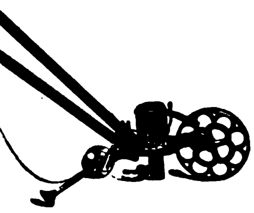
TORCH LILY. *Kniphofia*

TORÈNIA (after Olaf Toren, clergyman; traveled in China 1750–52 and discovered *T. Asiatica*). *Scrophulariàceæ*. About 20 species of annual or perennial herbs, mostly low, branching and somewhat decumbent, with simple, opposite, serrate or crenate leaves and tubular, somewhat 2-lipped flowers in terminal or axillary, few-fld. racemes. The species are mainly from tropical Asia and Africa. Calyx tubular, plicate or 3–5-winged, obliquely 3–5-dentate or 2-lipped at the top; corolla-tube cylindrical, usually much wider above; posterior lip erect, broad, concave, notched or more deeply cut; lower lip large, spreading, with 3 nearly equal lobes; stamens 4, perfect: capsule oblong; seeds numerous, small.

Torenias are of easy cultivation and are very useful for window-boxes, low borders or even for large masses. The flowers are not large but the plants are floriferous and keep in good leaf and flowers from spring to frost. *T. Fournieri* has the best habit for a bedding plant, but it may be bordered with *T. flava*. The plants are easily raised from seed, but may also be grown from cuttings, which root quickly.



2532. The hand-wheel hoe.



2533. A hand seed-sower.

A. *Fls. mainly yellow.*

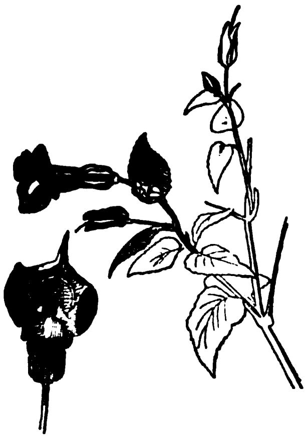
flàva, Bueh.-Ham. (*T. Bàilloni*, Godefr.). Usually decumbent and creeping: lvs. 1–2 in. long, ovate to oblong, coarsely crenate; petiole half as long as the blade or less: fls. axillary and solitary or scattered at the ends of the branches in pairs on an erect rachis; corolla-tube red-purple above, yellow beneath; corolla limb bright golden yellow with a purple eye. India and E. Asia. B.M. 6700. F. 1883:55.

AA. *Fls. mainly blue or white.*

Asiática, Linn. Annual, erect or diffuse: stem quadrangular: lvs. ovate or ovate-lanceolate, long-acuminate, serrate, obtuse, not cordate at the base, rough to the touch: peduncles axillary, single-fld.: corolla large; tube dark purple; limb 4-lobed, of a delicate pale purple-blue, with a dark blotch on 3 of the lobes, without a yellow eye; stamens 4, the 2 longer with a subulate spur. India. B.M. 4249.

Fourniéri, Linden (*T. edéntula*, Hort., not Benth.). Fig. 2534. Low, bushy, usually annual, becoming nearly 1 ft. high: stem 4-angled: lvs. petioled, cordate-lanceolate, 1–1½ in. long, crenate-serrate; petiole ½ in. long; corolla-tube narrow, yellow; corolla-limb 2-lipped, the posterior lip not cut, pale blue, the anterior 3-lobed: lobes round obtuse, dark purplish blue, the anterior lobe marked with a yellow blotch. I.H. 23:249. R.H. 1876, p. 465. B.M. 6747.—Var. **álba**, Hort. (var. White Wings) has pure white flowers. A.F. 5:401. G.M. 36:87. Var. **grandiflòra** has somewhat larger fls. and is more free-flowering. In the neighborhood of Philadelphia, self-sown seed sometimes germinates in the spring; also seeds of *T. flava*. F. W. BARCLAY.

Torenia Fournieri in Florida is an excellent substitute for the pansy, which is cultivated only with difficulty so far south. Young plants come up by the hundreds around the old plants from self-sown seed during the rainy season. The species can also be propagated with great ease by cuttings. The Torenia shows its full beauty when planted in beds or borders or in masses in front of small evergreen shrubs. It flowers abundantly throughout the summer, and even late in fall isolated flowers may be found. The best results are obtained by treating it as an annual. Any good and rich light soil seems to meet its requirements. It succeeds almost everywhere but prefers shade and moisture. It even grows luxuriantly in wet places along ditches and water-courses where forget-me-nots grow in the North. If such localities, however, are very shady, the flowers, though much larger, are neither produced as abundantly nor are they colored so brightly as in sunny situations. On the other hand, it is sometimes found in such dry positions, where only cacti and yuccas manage to live, that one can scarcely understand how it is able to succeed. In good soil the Torenia attains a height of from 8 to 10 inches, and when planted about 8 inches apart soon cover the ground entirely. There is already a great variety in colors, but the typical plant has beautiful light blue and royal purple flowers, with a bright yellow throat, in texture rivaling the most exquisite velvet. H. NEHRLING



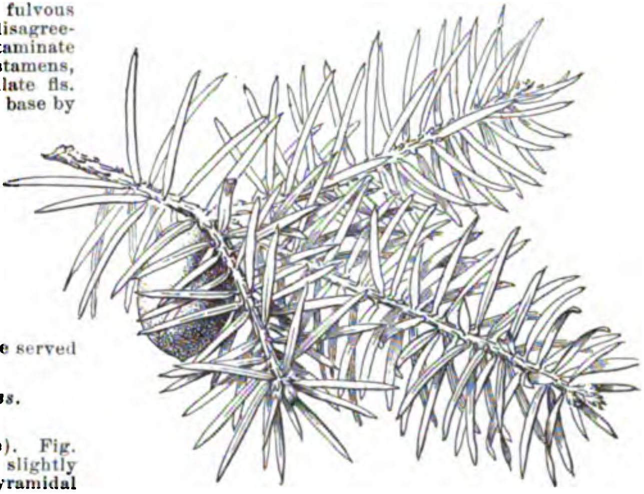
2534. Torenia Fournieri. Detached flower (× ½).

TORNILLO. See *Prosopis pubescens*.

TORRÉYA (after Dr. John Torrey, one of the most distinguished of the earlier American botanists; 1796–1873). Syn., *Tùmion*, *Caryotáxus*. *Coniferæ*. Ornamental evergreen trees, with spreading, usually whorled branches, clothed with yew-like, two-ranked, dark green foliage; the fruits are drupe-like and about 1 in. long. The Torreyas are but little known in cultivation and rarely seen in a flourishing condition. The southern

T. taxifolia survives the winters in very sheltered positions in the vicinity of Boston, but *T. Californica* is not hardy north. The Japanese *T. nucifera* is probably the hardiest and most desirable species, but seems not yet to have been tested north. Torreyas will probably grow best in shaded and sheltered positions and in a somewhat moist loamy soil. Prop. by seeds; also by cuttings and by grafting on Cephalotaxus. Plants raised from cuttings grow very slowly and usually remain bushy. For cions, terminal shoots should be selected.

There are 4 species in N. America and E. Asia. Trees, rarely shrubs: lvs. 2-ranked, linear or linear-lanceolate, with 2 narrow glaucous lines beneath, becoming fulvous with age; when bruised the foliage emits a disagreeable odor: fls. diœcious, rarely monœcious; staminate fls. ovoid or oblong, composed of 6–8 whorls of stamens, surrounded at the base by bud-scales; pistillate fls. consisting of a solitary ovule surrounded at the base by a fleshy aril and several scales: fr. drupe-like, consisting of a rather large seed, with thick woody shell entirely covered by a thin fleshy aril. The hard, strong and close-grained wood is much valued in Japan for cabinet-making and building. It is very durable in soil. In this country it has been used for fence posts. Rafinesque's Tumion has recently been taken up as the proper name for this genus, since the name Torreya was used for other genera before being applied to this; but there are good reasons why none of these older Torreyas can stand, and no useful purpose can be served by replacing the present name.



2535. Torreya taxifolia (× ¾).

A. *Lvs. linear, about ⅛ in. broad or less.*

B. *Length of lvs. ¾–1½ in.*

taxifòlia, Arnott (*Tùmion taxifòlium*, Greene). Fig. 2535. Tree, attaining 40 ft., with spreading, slightly pendulous branches, forming a rather open pyramidal head: bark brown, tinged orange: lvs. linear, acuminate, dark or dark yellowish green above, with narrow white lines beneath, ¾–1½ in. long: fr. obovate, dark purple, 1–1¼ in. long. Fla. S.S. 10:512.

BB. *Length of lvs. 1–3½ in.*

Califórnica, Torr. (*T. Myristica*, Hook. f. *Tùmion Califórnicum*, Greene). CALIFORNIA NUTMEG. Tree, attaining 70, or occasionally 100 ft., with spreading, slightly pendulous branches, forming a pyramidal or in old age round-topped head: bark grayish brown, tinged with orange: lvs. linear, slightly falcate, acuminate, lustrous and dark green above, 1–3½ in. long: fr. oblong-oval or oval, light green, streaked with purple, 1–1½ in. long. Calif. S.S. 10:513. B.M. 4780. F.S. 9:925. G.C. II. 24:553; III. 5:800, 801. R.H. 1875, pp. 76, 77; 1879, pp. 171, 172.

AA. *Lvs. lanceolate, one-sixth in. broad or somewhat less.*

nucifera, Sieb. & Zucc. Tree, usually 30 ft., but occasionally 80 ft. high, with spreading branches, forming a compact head, sometimes shrubby: bark bright red: lvs. lanceolate, acuminate, rigid and spiny pointed, very dark green above, with 2 white lines beneath, ¾–1¼ in. long: fr. ovoid, oblong, less than an inch long. Japan. S.Z. 2:129. R.H. 1873, p. 315.—The Chinese *T. grándis*, Fort., is very similar in foliage, but said to lack the disagreeable odor of the other species. R.H. 1879, p. 173. G.C. II. 22:681.

ALFRED REHDER.

TORTOISE PLANT. *Testudinaria Elephantipes.*

TOUCH-ME-NOT. *Impatiens aurea* and *biflora.*

TOURNEFÒRTIA (Jos. Pitton de Tournefort, 1656–1708; one of the earliest systematic botanists). *Borragináceæ.* A large genus comprising possibly 100 species widely scattered about the warmer portions of the world. Mostly trees and shrubs, rarely subshrubs, with alternate simple leaves and small flowers in terminal cymes.

heliotropioides, Hook. Properly **Heliotròpium anchusæfòlium**, Poir. A hairy, shrubby perennial, with aspect of garden heliotrope but not sweet-scented: lvs. elliptical, obtuse, wavy-margined: peduncles terminal, 2–3 times branched, bearing a 1-sided, 2-ranked raceme of many fls.: calyx 5-lobed, hairy; corolla-tube yellow, the limb 5-lobed, lilac. Buenos Ayres. B.M. 3096.—Self-sows and comes up in the garden spontaneously. Not popular North, but a good shrubby plant in the South.

F. W. BARCLAY.

TOWNSÉNDIA (David Townsend, botanical associate of Wm. Darlington, of Pennsylvania). *Compósitæ.* About 17 species of low, many-stemmed herbs, nearly all of which are natives of the Rocky Mts., with linear or spatulate, entire lvs. and rather large heads resembling those of Aster; the numerous rays from violet to rose-purple or white; flowering from early spring to summer. The annual or biennial species have larger heads than most of the perennials. Judging from the literature, the largest fld. of the perennials are *T. condensata*, *Wilcoxiana* and *Rothrockii*, three species which seem not to be in cultivation as yet. The species mentioned below are presumably among the most desirable of the genus. They are offered by collectors of Colorado wild flowers.

As a genus Townsendia is distinguished mainly by its akene, which is commonly beset with bristly duplex hairs, having a forked or glochidiate-capitellate apex. Townsendia is practically unknown to floriculture. For fuller account see Gray's Synoptical Flora of North America.

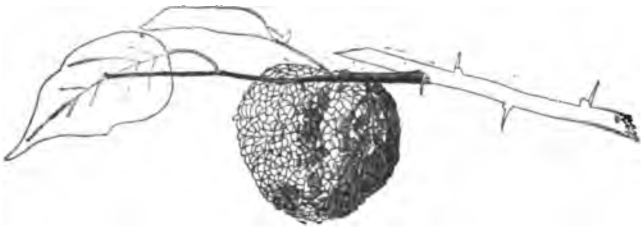
grandiflòra, Nutt. Biennial or annual, 9–18 in. high: stems spreading from the base: upper lvs. often linear: bracts of involucre conspicuously attenuate-acuminate: heads large; rays ½ in. long, bright blue or violet. Summer. Foothills western Neb. to Colo. and New Mex.

sericea, Hook. Nearly stemless perennial with sessile heads surrounded and surpassed by the linear lvs.: heads ¾ in. across; rays white or purplish tinged. April, May. Dry hills, plains or mountains, Saskatchewan to Rockies, south to New Mex. and Ariz.—Known as "Easter Daisy" in Colorado.

W. M.

TOXICOPHLÆA. See *Acokanthera*

TÓXYLON (*Bow-wood*, from the Greek). *Urticàceæ.* OSAGE ORANGE. One species, a thorny North American small tree, much used for hedges. Formerly known by Nuttall's name *Maclura* (named for Wm. Maclure, American geologist), but Rafinesque's Toxylon has a year's priority. The orange-like, inedible fruit is familiar to children. See Fig. 2536. The tree thrives in moist and rich or in ordinary or dry soils. Its roots are voracious feeders and rapidly deplete the soil. Hardy as far north as Massachusetts. A tree with deciduous, simple, alternate, petiolate, entire leaves and milky sap: branches, particularly the lower, beset with numerous straight, axillary spines 2–3 in. long: fls. minute, diœcious, apetalous, axillary, appearing in May to June, the staminate borne on the short spur-like branchlets of the previous year, racemose, pedicillate, pendulous; calyx 4-parted, with its segments valvate: stamens 4, the pistillate borne on branches of the current year, sessile, capitate; peduncle short, the 4-cleft calyx inclosing the sessile ovary: style simple, filiform, long and exserted: ovary superior, one-loculed; ovule solitary: fr. a dense aggregation of enlarged, fleshy calices into a globular syncarp with a mammillate surface, light green or yellowish in color: syncarp 4–5 in. in diameter, falling as soon as ripe in the autumn.



2536. Osage Orange—Toxylon pomiferum (× 1-5).

pomiferum, Raf. (*Maclùra aurantìaca*, Nutt.). OSAGE ORANGE. Fig. 2536. Tree, 30–50 ft. high: lvs. ovate to oblong-lanceolate. E. Kansas to N. Texas. Wood orange-colored. G.C. III. 16:693. G.M. 33:808, 809. R.H. 1896, p. 33 (var. *inermis*). V. 4:37.
EMIL MISCHE.

Before the advent of wire fences the Osage Orange was an extremely popular hedge plant, meeting general requirements better than any other plant suitable to our climate. It is used considerably, and where properly attended to from the start makes a hedge in a short time of a fairly defensive nature. Most dealers in tree seeds keep seeds of the Osage Orange, and those who grow the plants procure the seed in spring, drilling it in rows. The Osage Orange grows readily from seed, even when the latter is a year old. The sowing in rows gives the seedlings a chance to become stocky by fall and plants two feet high the first year are not uncommon. These one-year-old plants are quite good enough for hedging. Nurserymen who grow them for sale usually dig the plants in the fall, storing them away in a cool cellar, the roots buried in sand. They are then sorted into two grades, which compose first- and second-class plants. At the time of grading, the tops are chopped off somewhat, leaving about six inches of length only. This fits them for planting without more cutting.

The place where a hedge is desired should be well cleared of all weeds. If cultivated for a year in advance, so much the better, as it will make the keeping down of weeds a much easier task.

There are two ways of planting a hedge; viz., single row and double row. The double row is made by setting the plants nine inches apart each way, the plants in the second row coming between those in the first row, forming a zigzag line. The single row, however, is good enough, and is much easier to cultivate and keep clear of weeds. In single rows set the plants six inches apart.

The soil need not be overrich for the Osage Orange. The plant is a strong grower naturally, and soil in fair condition will give a growth more tractable to form a good hedge than a rank growth from rich soil.

When dug the Osage plants have very long roots, and the ends of these may be chopped off without disadvantage. If the plants are held in bunches and the roots chopped to an even length the setting will be an easy task. The tops will have been already cut off if treated in the way above suggested.

Beyond cultivation of the plants, nothing is required the first year. By fall a good growth should have been made, and towards spring this should be cut back, leaving about six inches of the young growth. The season following more care must be given to forming a hedge. When in full growth, say in July, shear off the tops of the plants. This will cause the side shoots to develop; and it is these side shoots which will form the base of the hedge. Another light trimming should be given when growth is over for the season, to bring the plants into a hedge shape. Much the same work will be required every year—a trimming when growth is in full swing to make the hedge bushy, and another later on to shape it.

The proper shape for a hedge is the conical form, though it may be flat-sided or in any shape desired, provided the upper branches never overlap the lower.

Of late years a system of planting the Osage Orange differing from the one described has been followed by some. Strong two-year-old plants are procured and are planted in a slanting position. As the new growth is made it rises in an upright way as usual, and this produces a lattice-like appearance of the branches, and a very strong hedge. It is certainly stronger than a common hedge, and yet a common one properly looked after forms a defensive fence, meeting all requirements, and costs not nearly as much as the other. See *Hedges*.
JOSEPH MEEHAN.

TRACHÈLIUM (Greek, *trachelos*, neck; from its supposed efficacy in diseases of the throat). *Campanulàceæ*. THROATWORT. A genus of 4 or 5 species of perennial herbs or low shrubs with usually somewhat simple stems and terminal panicles of small blue flowers. The species are native to the Mediterranean region of Europe. Calyx adnate; lobes 5, narrow; corolla narrowly tubular; stamens free from the corolla: capsule nearly globose: seeds small.

cærùleum, Linn. A half-hardy biennial or perennial, 1–3 ft. high: lvs. ovate, acuminate, unequally serrate: fls. blue or white, in dense, terminal cymes, in late summer. Shaded places in S. Europe. B.R. 1:72. Gn. 28, p. 181; 47, p. 303; 51, p. 84.—An attractive late-flowering perennial suited to culture as an annual. According to Gn. 28, p. 181, the species is fairly hardy in England, but young plants are more floriferous than old ones. Seed may be sown in March. The plant is easily propagated by cuttings. According to Gn. 47, p. 303, plants from cuttings are dwarfer than seedlings.
F. W. BARCLAY.

TRACHELOSPÈRMUM (Greek, referring to the fact that the seed has a neck). *Apocynàceæ*. Trachelospermum is a genus of 8 species of climbing shrubs native to eastern Asia and Malaya. They have opposite lvs. and white or purplish fls. in lax cymes. Generic characters: calyx 5-parted, glandular or scaly within: corolla salver-shaped; mouth constricted; lobes oblique, overlapping to the right, twisted to the left: stamens inserted above the middle of the tube; anthers conniving over and adhering to the stigma; cells spurred at the base: disk annular or of oblong glands: carpels 2, distinct, many-ovuled.

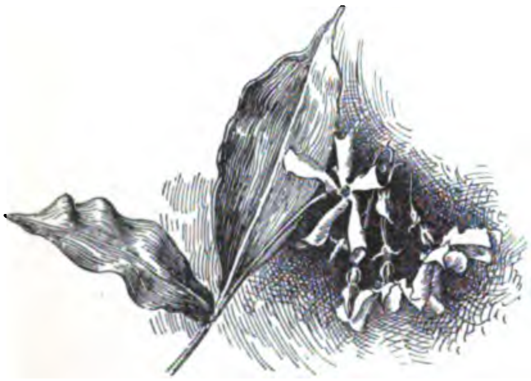
T. jasminoides, the STAR JASMINE, is a tender, evergreen, shrubby climber from China, with fragrant, white, 5-lobed flowers. It is a favorite in the South, where it is grown out of doors and known as the "Confederate Jessamine." In northern conservatories it is generally known under its synonym, Rhynchospermum. Handsome specimens may be grown in large tubs, making dense bushes 3 or 4 ft. high and as much in diameter. In May such specimens are covered with flowers and fill a greenhouse with their delightful fragrance. The blossoms are about an inch across, 5 or 6 in a cluster, pendulous, and of a very spirited appearance, which is largely due to the manner in which the 5 wavy-margined petals (or rather corolla-lobes) are rolled back. See Fig. 2537.

"Rhynchospermum" is a most satisfactory greenhouse shrub for a general collection. It requires no special treatment, except that the plants should be kept on the dry side during the winter.

It requires several years to work up a good-sized specimen. Young plants should be given warmhouse treatment and encouraged to grow. Large, well-established specimens thrive in a coolhouse. During summer the pots may be plunged outdoors in a partially shaded position. The species is propagated by cuttings of half-ripened wood taken with a heel in spring. The Star Jasmine is one of the many good old standard greenhouse plants that are too little seen nowadays. The writer knows of two large specimens trained to a bush form that are the chief shrubby ornaments of a cool greenhouse from late April to early June. Every year they are loaded with flowers throughout the month of May. The specimens require considerable room, and the gardener is sometimes compelled to keep them in a cold pit until the chrysanthemum season is over, although this treatment is not to be advised.

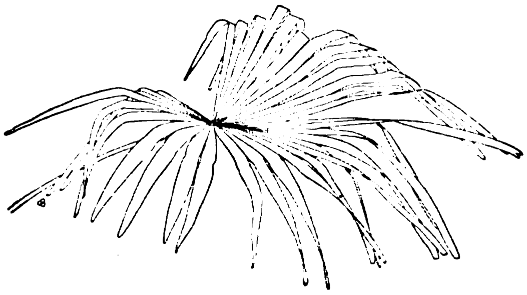
jasminoides, Lem. (*Rhynchospérmum jasminoides* Lindl.) STAR JASMINE. Also called "Confederate," "Malayan" or "African Jessamine." Fig. 2537. Tender, evergreen, climbing shrub described above: lvs. short-stalked, ovate-lanceolate, acute, glabrous: peduncles much longer than lvs.: calyx-lobes reflexed: corolla-tube contracted below the middle: several jagged scales at base of corolla: 5 large glands at base of ovary, 2 united, 3 free. Southern China. B.M. 4737. Gng. 5:132. Gn. 41, p. 507.—Var. **variegàtum**, Hort., has lvs. of green and white, tinged red. ROBERT SHORE and W. M.

Star Jasmine (*Trachelospermum jasminoides*) is a very choice and beautiful woody climber for the South. Being a native of the southern part of China, it is well adapted to the climate of the extreme South. It commences to bloom early in April and the last flowers can be enjoyed late in May. Even in October and November one may find numerous scattered flower-clusters. When in full bloom the plant seems to be covered with a white sheet, the flowers almost hiding the dark green foliage and filling the air for many yards away with a peculiar and most delicious fragrance. The Star Jasmine is beautiful even without flowers. It is not easily propagated and therefore it is not a common plant in gardens. Even plants with good roots require a great deal of intelligent care, and it is no easy matter to bring transplanted specimens into a flourishing condition. It should be transplanted into the garden in November or December, pot-plants always being preferable for this purpose. The soil should be kept moist all the time, and especially during the dry spells in April and May. If the soil is not naturally rich a moderate amount of fertilizer should be applied. When once established, the plant does not need any more care than the Carolina jasmine (see *Gelsemium*). In summer, during the rainy season, a mulch of grass and fresh cow manure is exceedingly beneficial. It is best grown on a trellis of two, three or even four posts about ten feet high, with strong galvanized wire all around; or strong laths can be used instead of wire. If the specimen is a strong and healthy one it will soon cover the trellis in a dense tangled mass and the new shoots will gracefully protrude to all sides. The propagation is best affected in Florida by layering, and strong plants can be raised in this way in about two years. H. NEHRLING.



2537. Trachelospermum jasminoides (× $\frac{3}{4}$).

TRACHYCÁRPUS (Greek, *rough* or *harsh fruit*). *Palmàceæ.* FORTUNE'S PALM, known under many technical names, is of unique interest to the horticulturist, as it is the hardiest of all palms. It is a spineless fan-palm which grows 30 ft. high. It is slightly hardier than *Chamærops humilis*, the only palm native to Europe. Fortune's Palm is the only trunk-producing palm which grows outdoors the year round in the southern and western parts of England. In some sheltered spots in these favored regions it has flowered regularly year after year. It is also called the Chusan Palm.



2538. Fortune's Palm—Trachycarpus excelsus (or T. Fortunei). The leaves finally become 4-5 feet across.

For practical purposes Trachycarpus is best considered a genus of four species, two of which are natives of the Himalayan region and two native respectively to China and Japan. The Himalayan species have their trunks clothed with the old leaf-sheaths, while the far-eastern species have beautiful, smooth, polished trunks. In each group one species has the tips of the leaf-segments pendulous and the other has them straight. These are the most obvious and important differences to the horticulturist, except that *T. Fortunei* is the hardiest of the whole genus. The differences above cited mark extreme types only. Intermediates occur. Much study has been given to this genus of palms and many characters to separate four species have been proposed at various times and subsequently abandoned. The latest botanical conception of the group (Beccari and Hooker in the Flora of British India, 6:436 [1894]) unites the Himalayan species into one and the far-eastern forms into another. In support of this view may be urged the important facts that smooth-trunked forms have lately been discovered as far west as Upper Burma, and also that the straight-tipped Japanese form may be merely cultivated or run wild in Japan. Its origin and nativity are not yet certain. Both points of view are given on the next page, each being correct for its own point of view. The horticultural account is based upon Hooker's notes in B.M. 7128, and the botanical is taken from the Flora of British India. Some botanists prefer the masculine case endings, others the feminine.

Fortune's Palm is grown indoors and outdoors in America wherever palms are grown, but it is not one of the most popular species with northern florists. It seems to reach perfection in California, where it is one of the most popular of all palms. Ernest Braunton writes that it is hardy throughout the southern half of the state, where it is commonly known by the appropriate name of Chinese Windmill Palm. It attains a height of 30 ft. Braunton adds that it is hardier than the native Washingtonia and will stand more abuse. It grows well near San Francisco. A new palm has recently come into California under the name of *Chamærops* or *Trachycarpus Phœdomia*, a name unknown to botany. All the specific names cited in the synonymy below have also been combined with Chamærops.

Generic characters: spadices many, interfoliar, stout, branched: spathes embracing the peduncle and branches of spadix, coriaceous, compressed, tomentose: bracts and bracteoles minute: fls. small, polygamo-monœcious; sepals 3, ovate; petals 3, broadly ovate, valvate; stamens 6; carpels 3; stigmas 3, recurved · ovules basilar; drupes 1–3, globose or oblong: seed erect, ventrally grooved; albumen equable.

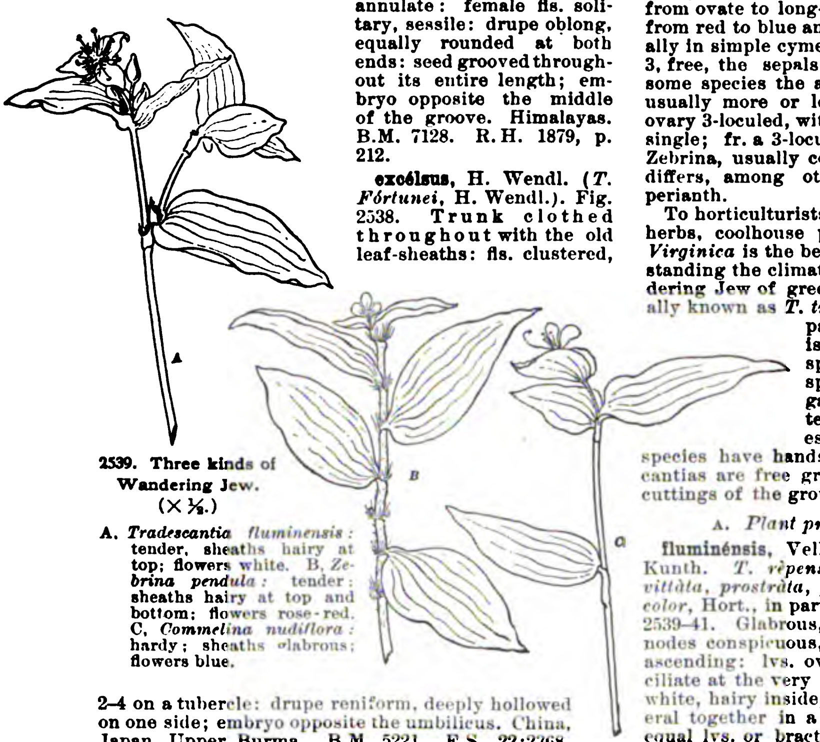
Horticultural View of Trachycarpus.

A. *Trunk clothed with old leaf-sheaths. Himalayan species.*
  B. *Tips of lvs. drooping: lvs. very glaucous beneath*....................**Martianus**
  BB. *Tips of lvs. straight: lvs. hardly glaucous beneath*....................**Khasyanus**
AA. *Trunk not clothed with old leaf-sheaths. Chinese and Japanese species.*
  B. *Tips of lvs. pendulous*....................**Fortunei**
  BB. *Tips of lvs. straight*....................**excelsus**

Following is the Latest Botanical View of Trachycarpus.

Martiànus, H. Wendl. (*T. Khasiànus*, H. Wendl. *T. Griffithii*, Decne.). Trunk for the most part naked, annulate: female fls. solitary, sessile: drupe oblong, equally rounded at both ends: seed grooved throughout its entire length; embryo opposite the middle of the groove. Himalayas. B.M. 7128. R.H. 1879, p. 212.

excélsus, H. Wendl. (*T. Fórtunei*, H. Wendl.). Fig. 2538. Trunk clothed throughout with the old leaf-sheaths: fls. clustered, 2–4 on a tubercle: drupe reniform, deeply hollowed on one side; embryo opposite the umbilicus. China, Japan, Upper Burma. B.M. 5221. F.S. 22:2368. R.H. 1868:370; 1870, p. 329. Gn. 47, p. 312; 52, p. 490. G.C. II. 24:305; III. 21:405; 24:420.
W. M.



2539. Three kinds of Wandering Jew. (× ⅓.)

A, *Tradescantia fluminensis*: tender, sheaths hairy at top; flowers white. B, *Zebrina pendula*: tender: sheaths hairy at top and bottom; flowers rose-red. C, *Commelina nudiflora*: hardy; sheaths glabrous; flowers blue.

Trachycarpus Fortunei is not a popular florist's palm for three reasons: First, it is not as beautiful as *Livistona Chinensis;* second, it is a slower grower, and this is an unpardonable fault to the average florist; third, there is a greater demand, generally speaking, for pinnate-leaved palms than for fan-leaved palms. The undersigned has not seen a plant of it for several years, but it was cult. in America more than 20 years ago.

It is dwarf in habit, rather slow-growing, the foliage dark green and somewhat stiff, and in texture decidedly tough. In a young state it bears much resemblance to *Livistona australis*, though the latter is more spiny and has longer footstalks.
W. H. Taplin.

TRACHYMÈNE (Greek, *rough membrane;* alluding to the fruit). *Umbelliferæ.* A genus of 14 species, 12 of which are Australian annual, biennial or perennial herbs, usually hirsute, with ternately divided leaves and blue or white flowers in terminal umbels. Calyx-teeth minute; petals entire, obtuse, imbricated: fr. compressed. Flora Australiensis, Vol. 3.

cærùlea, R. Grah. (*Didiscus cærùleus*, DC.). An erect annual about 2 ft. high, somewhat hairy: lvs. 1–2-triparted, with linear, acute, 3-cut lobes: peduncles long, bearing an umbel 2–3 in. across of very numerous blue fls.; calyx-teeth obsolete; petals unequal, the external being longer. July–Oct. Australia. B.M. 2875. B.R. 15:1225.
F. W. Barclay.

TRADESCÁNTIA (John Tradescant, gardener to Charles I.; died about 1638). *Commelinàceæ.* Spiderwort. Thirty-six species are admitted by C. B. Clarke, the latest monographer, 1881 (DC. Monogr. Phaner. 3). This enumeration does not include *T. Reginæ* and other recent species. They are all American perennial herbs, ranging from Manitoba to Argentina. In habit they are various, varying from erect bushy species to trailing plants rooting at the nodes. The plants are more or less soft and succulent in texture, although usually not fleshy. The leaves are alternate, sheathing, varying from ovate to long-linear-lanceolate. The flowers vary from red to blue and white, sometimes solitary but usually in simple cymes or umbels; sepals and petals each 3, free, the sepals sometimes colored; stamens 6, in some species the alternate ones shorter, the filaments usually more or less bearded at the base or above: ovary 3-loculed, with 2 ovules in each locule, the style single; fr. a 3-loculed dehiscent capsule. The genus Zebrina, usually confounded with this by gardeners, differs, among other things, in having a tubular perianth.

To horticulturists, Tradescantias are known as hardy herbs, coolhouse plants and warmhouse plants. *T. Virginica* is the best known of the hardy species, withstanding the climate of the northern states. The Wandering Jew of greenhouses and hanging baskets, usually known as *T. tricolor*, is partly *T. fluminensis* and partly *Zebrina pendula*. *T. Reginæ* is perhaps the best known warmhouse species at present, although various species may be expected in botanic gardens and the collections of amateurs. The glasshouse species are essentially foliage plants. Several species have handsomely striped leaves. All Tradescantias are free growers, propagating with ease from cuttings of the growing shoots.

A. *Plant prostrate, rooting at the joints.*

fluminénsis, Vell. (*T. múndula* and *T. albiflòra*, Kunth. *T. rèpens*, *rèpens vittàta*, *viridis*, *viridis vittàta*, *prostràta*, *procúmbens*, *stridta*, Hort. *T. tricolor*, Hort., in part). Wandering Jew in part. Figs. 2539–41. Glabrous, with shining stems and leaves, the nodes conspicuous, trailing, or the ends of the shoots ascending: lvs. ovate-acute, without distinct petiole, ciliate at the very base, the sheaths ¼–⅜ in. long: fls. white, hairy inside, the 6 stamens all alike, borne several together in a sessile cluster subtended by 2 unequal lvs. or bracts, the pedicels not all of same age. Central Brazil to Argentina.—One of the commonest of greenhouse and basket plants. In greenhouses, usually grown under the benches. When the plants grow very vigorously and have little light, they are usually green, and this is the form commonly known as *Viridis*. There are forms with lvs. striped yellow and white, but these colors usually do not hold unless there is abundance of sunlight. In light places, the lvs. become red-purple beneath. Very easily propagated by cuttings or pieces of shoots at any time of the year. The plant needs plenty of moisture in order to grow vigorously. Three plants are known as Wandering Jew, and although they belong to three genera, it is not easy to tell them apart when not in flower (Fig. 2539). These plants are *Tradescantia fluminensis*, sheaths hairy or ciliate only at the top, fls. white; *Zebrina pendula*, sheaths hairy throughout or at least at base and top, lvs. redder beneath and always colored above, fls. rose-red; *Commelina nudiflora*, sheaths glabrous, fls. blue. The two first are tender to frost; the

2540. Flower of Tradescantia fluminensis. Natural size.

last is hardy in the open ground in central New York. All of them are used for baskets and vases. The two first are best known and are the plants commonly known as Wandering Jew. All of them may have striped foliage. See *Commelina* and *Zebrina*.

AA. *Plant erect, or ascending from a decumbent base.*

B. *Species grown primarily for the colored foliage: greenhouse kinds.*

C. *Stem none, or scarcely rising above the ground.*

fuscàta, Lodd. (properly *Pyrrheima Lóddigesii*, Hassk.). Stemless, brown-tomentose or hairy: lvs. oblong-ovate, entire, about 7-nerved, short-petioled: fls. blue or blue-purple, 1 in. or more across, borne in the midst of the lvs. on very short pedicels, stamens 6. S. Amer. L.B.C. 4:374. B.R. 6:482. B.M. 2330.—Lvs. 6–8 in. long. Now referred to Pyrrheima, being the only species.

CC. *Stem evident, usually branching.*

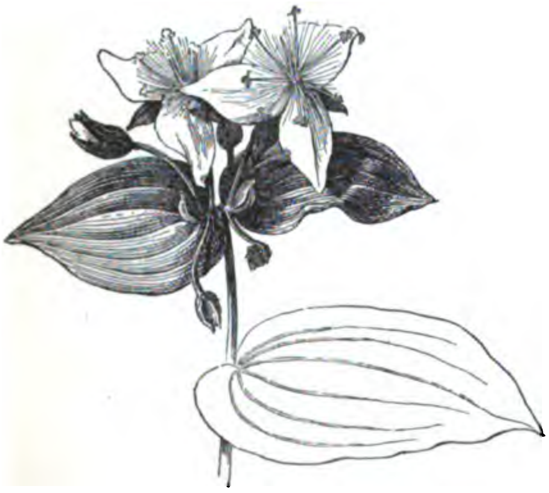
D. *Lvs. distichous (in 2 rows).*

Regìnæ, Lind. & Rod. Stiff-growing upright plant: lvs. lanceolate-acuminate, sessile, set closely on opposite sides of the stem and spreading nearly horizontally, about 6 in. long, the center purplish crimson, with feathered border, the space towards the margins silvery, the very edge of the leaf darker, the under side purple. Peru. I.H. 39:147; 40:173 (3); 41, p. 14. G.C. III. 11:699; 13:477. R. B. 19:113.—Introd. into Belgium from Peru in 1870. Named for the Queen of the Belgians. Perhaps a Dichorisandra.

DD. *Lvs. not 2-ranked.*

E. *Stamens all equal and similar.*

Warscewicziàna, Kunth & Bouché (*Dichorisándra Warscewicziàna*, Planch.). Fig. 2542. Dichorisandra-like, having a stout caudex or trunk, marked by leaf-scars and finally branching: lvs. green, stiffish, 1 ft. or less long, clustered at the top of the stem, recurving, lanceolate-acuminate: fls. lilac-purple, numerous in small crowded clusters along the branches of a panicle-like cluster. Guatemala. B.M. 5188. R.H. 1860, p. 136.



2541. Wandering Jew—Tradescantia fluminensis. Natural size.

EE. *Stamens unequal,—3 long and 3 short.*

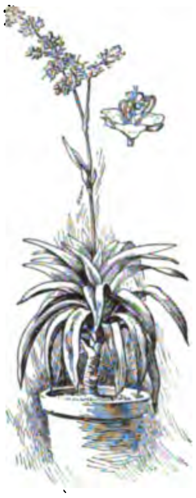
elongàta, Meyer. Nearly glabrous, procumbent and rooting at the base, then suberect to the height of 1–2 ft.: lvs. lanceolate or oblong-lanceolate, acuminate, sessile, light glaucous-green above and striped with silver, reddish purple beneath: peduncles 1–5, terminal: fls. rose-colored, the sepals green. Tropical Amer.

BB. *Species grown as border plants for their flowers: native kinds.*

C. *Umbels sessile.*

Virginiàna, Linn. COMMON SPIDERWORT. Erect, branching, 1–3 ft., glabrous or nearly so: lvs. conduplicate, very long linear-lanceolate (6–15 in. long), clasping: umbels several-fld., terminal, the pedicel recurving when not in bloom: fls. violet-blue, in various shades, 1–2 in. across, produced freely nearly all summer. N. Y. to S. Dakota, Va. and Ark. B.M. 105; 3546 (as *T. caricifolia*). L.B.C. 16: 1513 (*as T. elata*).—An exceedingly variable plant. Var. **occidentàlis**, Britt., is in the trade. It has much narrower lvs. and smaller fls. and is usually dwarf. There are several horticultural forms. Var. **álba** has white fls. B.M. 3501. Var. **atrosanguìnea** has dark red fls. Var. **coccìnea** has bright red fls. Var. **cærùlea** has bright blue fls. Some of the forms would better be regarded as species. See Rose, Contr. Nat. Herb. 5:204.

brevicaùlis, Raf. Villous, 1 ft. or less high, sometimes nearly acaulescent: lvs. mostly from near the ground, linear-lanceolate, more or less ciliate: fls. about 1 in. across, blue or rose-purple. Ky. to Mo.



2542. Tradescantia Warscewicziana.

CC. *Umbels peduncled.*

ròsea, Vent. Slender and nearly or quite simple, glabrous, .12 in. or less tall: lvs. very narrow-linear: bracts short and scale-like: fls. ½–¾ in. across, rose-colored. Md. to Mo. and south. Mn. 2, p. 36.

T. crassifòlia, Cav. Something like T. Virginiana, but lvs. short and broad (oblong-ovate, ciliate, as also the stem: fls. 1½ in. across, blue-purple, in terminal and axillary sessile umbels, the stamens all equal. Mex. B.M. 1598.—*T. Crássula*, Link & Otto. Somewhat succulent, ascending: lvs. thick, oblong and nearly or quite obtuse, glabrous except on the edges: fls. about ¼–½ in. across, white, in terminal and lateral often stalked umbels, the calyx and pedicels hairy. Brazil. B.M. 2935. L.B.C. 16:1560.—*T. decòra*, Bull. Foliage plant: lvs. long-lanceolate, dark olive-green with a central gray band. Brazil.—*T. discolor* is Rhœo discolor, which see (p. 1526).—*T. dracænæfòlia*. "A noble and rapid-growing plant, with luxuriant and handsome foliage. The leaves in many respects resemble a dracæna and are a deep green, marked with chocolate or black. . . When fully grown the plant will send out long runners, bearing out tufts of leaves at the end." John Lewis Childs, Catalogue 1900.—*T. multicolor*, Hort. See Zebrina.—*T. naviculàris*, Ort. Much like T. Virginiana: stoloniferous: stem much branched: lvs. ovate-acute, sessile, boat-shaped: umbel terminal, many-fld., with 2 foliaceous bracts: fls. rose-colored, the stamens all equal. Peru. Mentioned in European literature as a warmhouse subject.—*T. quadricolor*, Hort. See Zebrina.—*T. supèrba*, Lind. & Rod. Lvs. oval-oblong-acuminate, sessile, purple beneath, dark metallic green with a white band on either side of midrib. Peru. I.H. 39:155; 40:173 (6). Gt. 46, p. 163. Perhaps not a Tradescantia.—*T. zebrìna*, Hort., is Zebrina pendula.

L. H. B.

TRAGOPÒGON (Greek for *goat's beard*). *Compósitæ*. GOAT'S BEARD. Between 30 and 40 species of erect biennial or perennial herbs with narrow grass-like leaves and heads of yellow or purple flowers, belonging to the ligulate section of the composite family (tribe *Cichoriaceæ*). Florets perfect, with slender style-branches and sagittate anthers; pappus composed of bristles in a single series and mostly raised on a beak; involucre cylindric or nearly so, with approximately equal bracts in a single row. The Tragopogons are mostly weedy plants with a tap-root. They are native to outhern Europe, northern Africa and central and southern Asia. One of them is cultivated for its edible tap-root (salsify) and another is now a frequent weed in this country. The flowers of these open only in the morning.

A. *Flowers purple*

porrifòlius, Linn. Salsify. Vegetable Oyster. Oyster Plant. Figs. 2238, 2543. Tall strict biennial, sometimes 4 ft. high when in bloom, glabrous: fls. showy, closing at noon or before, the outer rays exceeded by the involucre scales: peduncle thickened and hollow beneath the heads. S. Eu. Naturalized in many parts of the country, often becoming a persistent weed. See *Salsify*.

2543. Flowers of Salsify or Oyster Plant — Tragopogon porrifolius (× ⅓).

AA. *Flowers yellow.*

praténsis, Linn. Goat's Beard. More or less branched, 3 ft. or less tall: outer rays exceeding the involucre scales: peduncle scarcely swollen. A weed from Europe.

L. H. B.

TRAILERS. See *Vines*.

TRAILING ARBUTUS. *Epigæa repens*.

TRAILING BEGONIA. *Cissus discolor*.

TRAINING. See *Pruning*.

TRANSPIRATION is the process by which water is given off in the form of vapor from leaves and stems. Instead of a circulation of the sap in plants similar to the movements of the blood of animals, water containing mineral salts is taken in at the roots in liquid form and carried upward to the leaves through the woody tissue, and then evaporated, leaving the mineral or ash behind in the leaf, where it serves in making food. The chief purpose of transpiration is, therefore, to carry a stream of mineral food from the soil to the green parts of the plant, although it also serves to aid in the exchange of gases with the air, and preserves more equable temperatures of the body of the plant.

Minerals may be absorbed by the plant only in very dilute solutions. Hence it is necessary for the plant to lift several thousand pounds of water to the leaves in order to obtain one pound of minerals. After the mineral-laden water reaches the green organs it is of no further use and must be evaporated. It is estimated that 98 per cent of the energy received from sunlight by the plant is used in this important work. That an enormous amount of work is performed by the plant in transpiration may be seen when it is known that a single sunflower plant will evaporate a pint of water from its leaves in a single day, and about seventy times this much in the course of its development. A birch tree with 200,000 leaves will transpire from 700 to 1,000 pounds of water daily in the summer. A single oak tree will throw 120 or 130 tons of water into the air during the course of a season, and an acre of beech trees containing 400–600 specimens will transpire about 2,000,000 pounds in a single summer.

To determine the exact amount of water transpired by a plant, a specimen not more than a yard in height growing in a pot may be used. Set the pot on a square of oil-cloth, then bring the cloth up around the pot and tie closely to the stem of the plant. This will prevent evaporation except from the shoot. Now set the prepared plant on one pan of a scale, together with a small measuring glass, and balance. Allow the plant to remain in the warm sunshine for eight hours, then pour water into the measuring glass until the scale shows original position or reading. The water in the glass will represent the amount of transpiration.

To demonstrate that water vapor does actually come from the leaf, cut off a small leafy shoot of any convenient plant and thrust the base of the stem through a piece of cardboard into a tumbler of water; now cover the exposed part of the shoot with another tumbler and set in a warm, light place. Moisture, which could have come only from the leaves, will soon gather on the glass.

Some transpiration occurs over the entire surface of the plant, although only about one-thirtieth as much is given off by a stem as from the same amount of leaf surface. The leaves are specially adapted to carry on this function. The interior of the leaf is made up of a great number of loosely arranged cells which evaporate water into the air between them. The air in the leaf communicates with the atmosphere through openings called stomata, which are generally placed on the lower side of the leaf. Consequently the watery vapor diffuses out through the stomatal opening. The stomata are controlled by guard-cells which may completely close them up, and the action of the guard-cells is under the control of the plant. When the plant is losing too much water the stomata close; and they are variously affected by winds and sunshine.

Species growing in very dry localities adapt themselves to the conditions by building only limited surfaces from which transpiration may take place and by reducing the number of stomata. The cactus is an example of this type, and this plant transpires only about one three-hundredth as much water as a leafy plant of the same volume. As might be expected, the character and amount of the mineral salts in the soil also affect the amount of transpiration.

D. T. MacDougal.

TRANSPLANTING is a general term used to designate the removal of living plants whereby they may become established in new quarters. Transplanting may be performed when the plant is in a dormant condition, as in winter, or when it is still actively growing. Small herbaceous plants are usually the only ones that are transplanted when in a growing condition, and this only when the plants are living under special garden conditions where they may have the best of attention as to watering and shading. Considered from the standpoint of the plant, transplanting is always a violent operation, for it destroys a considerable part of the root-system, loosens the plant's attachment to the soil and arrests for the time being a large part of its progressive vital activities. In order to overcome these dangers the earth into which the plant is set should be well prepared and moist, so that the plant may quickly reëstablish itself; part of the top usually should be removed in order to lessen transpiration, and with succulent and growing plants some shade should be provided for a time. The deeper and finer the soil, and the greater the quantity of moisture it holds, the more successful the transplanting operation will be, other things being equal. The operation is also more successful in humid regions, as in the Atlantic states, than it is in dry regions, as on the plains and westward. In the more arid parts of the country transplanting is performed as little as possible, whereas in the eastern part great quantities of annual and other garden plants are transferred from seed-beds to the open ground.

The successful transplanting of any plant depends in part on the condition of the plant itself. The younger the plant, as a rule, the better it withstands the opera-

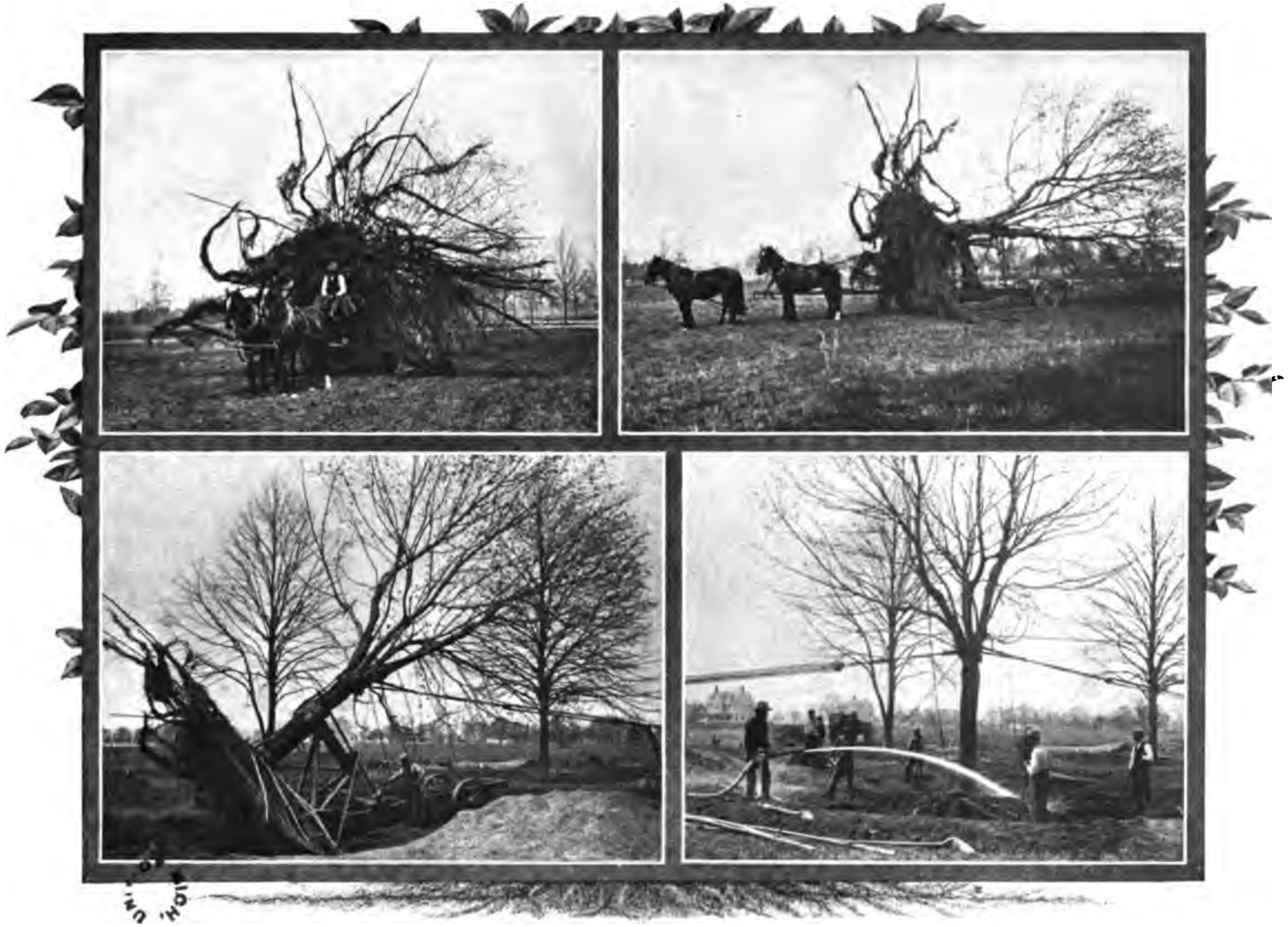


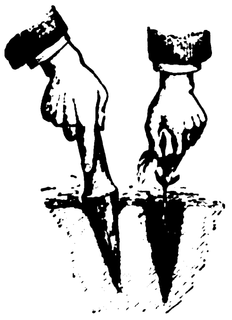
Plate XLIII. Various stages in the transplanting of a large tree. See *Transplanting.*

tion. Herbaceous or growing plants that are relatively short and stocky and compact in growth transplant better than those that are long, "leggy," and weak. The stocky plants are better able to withstand the vicissitudes of inclement weather when they are transferred from a protected place to the open air, and they probably also have more recuperative power to make new roots and to attach themselves again to the earth. Many plants may be "hardened off" or gradually inured to sun and cold before they are transplanted. The more frequently a given plant is transplanted the more readily it endures transplanting. The root-system becomes close and compact and there is relatively less injury to the roots at each subsequent removal, providing a long interval does not take place between the operations.

The success of transplanting also depends to some extent on the weather at the time the removal is performed. If cool, cloudy and damp weather follows the transplanting, the plants are much more likely to live. Plants usually establish themselves more quickly in freshly turned soil, because it contains a relatively large amount of moisture. In order to bring the earth into contact with the roots, it should be firmed closely about the plants. This packing of the soil tends to bring the subterranean moisture upwards where it may supply the roots; it also tends to increase evaporation from the surface of the soil and thereby to waste the water, although much of the moisture is utilized by the plant as it passes upwards. In order to prevent the escape of moisture from the surface of the soil, it is customary to cover the ground with a mulch, from one to three inches in depth, of litter, sawdust, leaves or coarse manure. When practicable the water may be saved by keeping the surface well tilled, thereby providing a mulch of earth.

In dry weather it may be advisable to water newly set plants, particularly if they are green and growing fast, as tomatoes, cabbages and other annuals. The watering may best be done at nightfall. The water should be applied in a hole or depression about the plant or at one side of it, rather than on the surface; and the following morning the loose, fresh earth should be drawn over the roots in order to provide a surface mulch and to prevent the soil from packing.

All kinds of plants can be transplanted, but some of them remove with great difficulty. In these cases the special skill which is born of experience with these particular plants must be invoked for success. The difficulties are of various kinds. In some cases the difficulty may be a tap-root system, as in the case of the black walnut and the hickories. In these instances the plant may be prepared a year or two in advance by severing the tap-root some distance below the ground by means of a spade or other sharp instrument that is thrust underneath the crown. In other cases the difficulty is the inability of the plant to make new feeding roots quickly, as in some of the asiminas or papaws. Such plants often may be treated like the tap-rooted plants; that is, the long, cord-like roots may be severed at some distance from the crown a year or two before the plants are to be removed. In other cases the inability to be transplanted is probably due to the excessive rate of transpiration from the foliage. In these instances cutting back the top rather severely and providing shade may contribute to success. In some cases the difficulties are so great as practically to prohibit transplanting.



2544. A dibber.

One of the most useful implements to aid in the transplanting of small plants. The plant is dropped into a hole made by the dibber; this hole is closed by inserting the dibber at the side and moving it against the plant.

So-called transplanting machines have been perfected within the last few years for setting small herbaceous stuff, as cabbages, tobacco and tomatoes. These are really vehicles, drawn by horses, that open a furrow and drop a small quantity of water when the plant is inserted in the furrow by the hands of an operator who rides on the machine. The plants, already prepared for setting, are carried in a tray or hopper, and the operator places these between guards which automatically measure the distance. These machines are particularly valuable in large areas where great quantities of plants are to be set, and also in hard and dry land where it is difficult to make the proper openings with the hand and also otherwise to supply the plant with sufficient water. For most small plants that are to be reset in small quantity, the dibber is a most useful implement to expedite the operation. Fig. 2544.

2545. A transplanting box, specially designed for melons.

It is made of a "flat" or splint 14 in. long and 3¾ in. wide, bent at four corners and held in place by a tack. It has no bottom.

Plants grown in pots and small shallow boxes transplant more readily than those grown in the open soil. Particularly is this true of pot-grown plants, for the bevel or slope of the pot allows the ball of earth to be "knocked out" readily. See *Potting*. Special transplanting boxes are on the market, to be used instead of pots, for purposes of economy. These boxes are usually made of thin basket stuff and are thrown away when the plants are taken from them for transplanting. Fig. 2445. The seeds are sown directly in these boxes. Melons, cucumbers and other plants that are difficult to transplant are often grown on pieces of inverted turf, taken from old pastures.

In the case of large trees and shrubs, success often may be attained by transplanting in the winter, when a ball of frozen earth may be removed. Fig. 2546. It is usually better to give the transplanting of large trees into the hands of an expert, than to attempt to perform it with unskilled help and inefficient appliances. Only a small proportion of the efforts in transplanting very large trees are really successful. The trees may live for several years and yet never fully recover nor make satisfactory subjects. The surest and best results are usually secured only when the trees are nursery-grown and have been transplanted two or three times within a few years of their final removal. There are some species that remove from the wild with relative ease when they are of large size, among which are elms, maples, pin oak, basswood; but the large number of species do not readily recuperate from the operation.

It is sometimes said that a plant cannot recover from the transplanting operation, that the severing of the roots inflicts injuries that are not outgrown, and that a new type of root-system develops. These fears appear to be ungrounded. In many cases the plant does not regain itself, but these instances are probably due to lack of skill in the operation rather than to any inherent difficulty in the transplanting process itself. But even if the transplanting process were to be found to be theoretically injurious, nevertheless it must be employed in the practice of modern horticulture. L. H. B.

Transplanting Large Trees (Plate XLIII).—The principles of transplanting large or small trees are the same, excepting as regards the mechanics of transportation. Types of machinery for moving deciduous trees may be classified as follows:

The most primitive device is a two-wheeled cart with a pole. The tree is dug, and the cart is secured to it with the trunk resting in a notch in the axle or bolster, and the pole lashed up among the branches. The tree is pulled over and dragged root foremost.

2546. Moving a tree in winter, with a large ball of frozen earth.

In a modification of the above, a platform under the ball connects the rear axle, bearing the tree, with the front axle. Of this type are the Hall, Estes, Santimer, Rutherford and other patents. In one form the tree is loaded top foremost, and by means of a turn-table above the rear axle, swung around to position. These machines usually carry a ball of earth and roots, 7 to 9 ft. in diameter, cut shorter on the side next to the platform.

For moving trees in an upright position, there are low platform trucks, and trucks with two high perches. In the latter, one perch or a section of the axle is removed to admit the trunk between the perches. This form is used in England; also a similar one in which the tree is swung vertically beside the axle of a two-wheeled cart drawn by one horse. When carried vertically, the top interferes with electric wires and the tops of other trees, and the roots are injured by the platform or other support. It is not practicable to carry a spread of 30 or 40 ft. of roots between the wheels.

House-mover's rigging is adapted to moving trees for short distances, but is so slow that the fine feeding roots outside the central ball of earth are likely to dry out, and get broken by the work.

Trees are carried horizontally with the trunk resting on two benches on a low truck. The tree may be tipped over on the benches by tackle, or loaded and unloaded by derrick. The derrick legs usually interfere with the full circle of roots, and as the derrick has to be set up twice for each tree moved, the operation is slow, and, with the tree swinging in midair, somewhat dangerous. For moving trees a few feet, a derrick may be used, with or without small wheels in the base of the derrick legs. Many kinds of machines may be used, but in order to make this discussion concrete, the following account has reference to the device shown in Plate XLIII. Other successful moving operations are shown in Figs. 2547, 2548.

For operating the mover shown in Plate XLIII, the tree, of say 14–26 in. diameter of trunk, is dug by starting a circular trench with a diameter of 30–40 ft. An under cut is made beneath the roots with a light prospecting pick, and the soil picked out and caved down with a spading fork or picking rod, the points of which are rounded to avoid cutting off the roots. The loose dirt is shoveled out of the bottom of the trench. The roots, as uncovered, are tied in bundles with lath yarn and bent up, out of the way of the diggers. See Fig. 2549. If the roots are to be out of the ground over one day in dry weather the bundles may be wrapped in clay mud, damp moss and straw, or burlap. When the digging has progressed to within 4 to 8 ft. of the center, the tree is slightly tipped over to loosen the central ball, which cleaves from the subsoil near the extremities of the downward roots. On sand or hard-pan subsoil this is at a depth of 2 to 5 feet. In deep soil it may be necessary to cut some downward roots. A ball of earth is left in the center from 5 to 12 ft. in diameter, or as heavy as can be drawn by four to eight horses. This ball is not essential with deciduous trees, but it is easier to leave it than to remove and replace the soil. With fine-rooted trees like the red maple, it is difficult to pick out the soil, while with coarse-rooted trees, like the beech, in gravelly soil, the ball drops to pieces.

For loading, the cradle which is pivoted above or back of the axle is swung over to the tree, the trunk having first been wrapped with cushions and slats. The trunk is clamped to the cradle by chains and screws without injuring the bark. By means of a screw 9 ft. long operated by a ratchet lever or hand-brake wheel, the cradle lifts the tree from the hole and swings it over in a horizontal position. Pulling in the same direction, by tackle fastened in the top of the tree, aids the work of the screw.

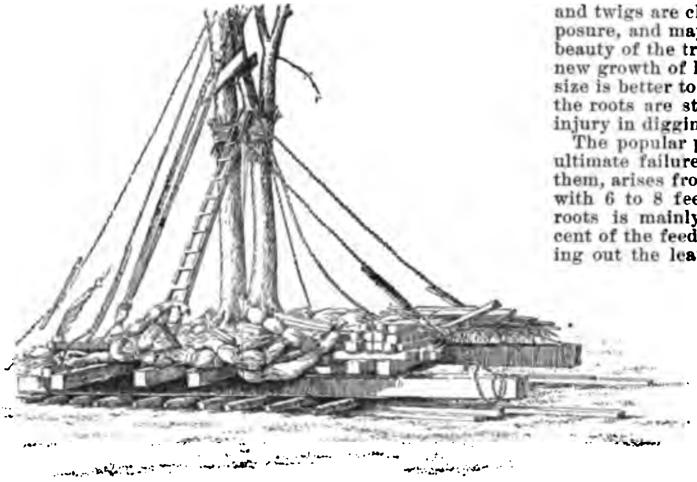
After the tree is loaded, the roots on the under side of the axle are tied up to the perches. The front wheels are on pivots, therefore the roots are not broken by the swinging of the axle. The roots are drawn aside to put in the pole and driver's seat. Planks are placed under the wheels, and the mover is pulled out of the hole by tackle.

The hole to receive the tree is prepared with a layer of soft mud in the bottom, which partly fills the crevices as the tree is lowered into it. The weight of the tree is not allowed to rest upon and crush the downward roots, but is supported by the mover until fine earth is packed in. Soil is worked down between the roots in the form of mud by means of a stream of water and packing sticks. One man shoveling, two or three with packing sticks, and one with hose is the right operation until the center is made solid. The packing sticks are 2 in. in diameter, 6 ft. long, and pointed at one end and round at the other. The side roots are next unwrapped and covered at their natural depth.

2547. A large tree removed from its place. The roots are now to be wound in burlaps or other material.

While the tree is horizontal, it may be most conveniently pruned. Th outside should be cut back 1 to 3 ft., cutting to a crotch or bud, and the remaining twigs thinned out about one-third. Hardwood trees and trees with few roots need the most severe pruning.

The soil should be friable loam, not baking clay nor sterile sand, and it should be made fertile. The surface should be covered with a soil or straw mulch 3 inches deep and the earth kept moist by watering once a week or less frequently, as required. The roots may be damaged by too thick mulch, deep planting, excess of water or lack of drainage, all of which exclude the air. Decaying manure and caustic fertilizers in direct contact with the roots are injurious.



2548. The roots wrapped, and the tree being moved on skids.

The tree may be secured by guy wires. Anchor posts are set slanting, 4½ ft. in the ground, with a crosspiece just below the surface. Two to six strands of No. 11 galvanized steel wire are used. The wire is run from the post, through a piece of hose around the tree, and back to the post. It is twisted tight, with two sticks turning in the same direction and moving toward each other. To prevent the sun from drying out the bark on the south side of the tree, the trunk should be wrapped with straw, especially thin-barked trees, like beech and silver maple.

The best trees for moving are those with abundant small roots. These have fibers branching from them which take in the water and plant-food. The large roots in the center of the root-system are conduits for the sap, and braces for the tree. Trees which transplant successfully are the maple, horsechestnut, elm, catalpa, ash, linden, willow, poplar and pin oak. Trees with few fine roots and hard wood, as the hickory and white oak, are difficult to transplant with good results, as well as the tender-rooted trees like magnolia and tulip. Trees grown in the open are much better for moving than those in the woods. The roots are more numerous, and not mixed with the roots of other trees, the bark is thicker and does not dry out so quickly, the branches and twigs are closer and better developed to stand exposure, and may be thinned out without destroying the beauty of the tree, and more plant-food is stored for the new growth of leaves and roots. A young tree of large size is better to move than an old tree. In friable loam the roots are straighter and tougher and less liable to injury in digging, than in hard or rocky soil.

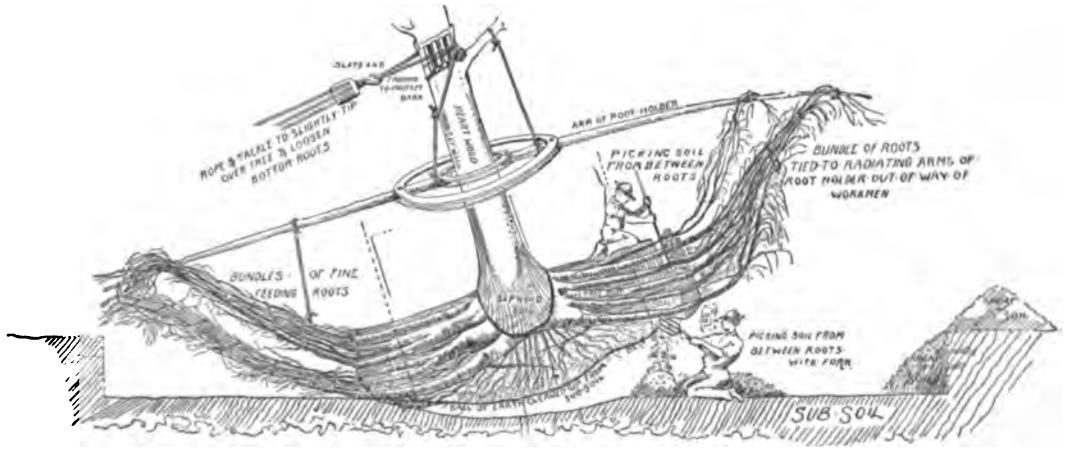
The popular prejudice that moving large trees is an ultimate failure, or that small trees quickly overtake them, arises from moving trees 1 to 2 feet in diameter with 6 to 8 feet diameter of roots. As this mass of roots is mainly the large roots, and from 70–90 per cent of the feeding roots are lost, the tree, after sending out the leaves with its stored plant-food, fails to support all the foliage and bark. In successive seasons its branches die, or the growth is short and yellow and the bark dies on the south side.

For moving large coniferous evergreens, it is usually considered necessary to keep a ball of earth intact. The foliage is constantly transpiring, and if the roots become dry, the sap does not flow again. As it is not generally feasible to move balls of over 12 feet diameter and 3 feet in depth, the size of evergreens which it is practicable to transplant is smaller than of deciduous trees.

The digging is started as in Fig. 2550. The flexible roots are wrapped against the ball by twisting them with a cord, and the large, stiff roots are cut off. The ball may be held by frost, or by upright staves, iron bands, or irons in the form of a pot split in halves and held by bolts or clamps. The best method is the use of a canvas band, wider than the depth of the ball, cut to fit. It has draw ropes operated by levers which firmly compress the earth, without damaging the small roots wrapped against the ball. A hammock, consisting of several ropes to distribute the pressure, is attached to a windlass. A platform is placed with a chisel edge in the under cut. By means of the windlass, the ball is cut off from the subsoil and the platform, with the tree, loaded upon a truck.

In planting, the hammock is reversed and holds the ball, while the platform is pulled out by the windlass, leaving the tree in the hole. By this method, trees 20–40 feet high and 6–12 inches in diameter may be moved.

Trees grown in fertile clay loam are best for transplanting, but with care the canvas will hold balls of sand or gravel. Root-pruning, one or more years pre-


ROPE & TACKLE TO SLIGHTLY TIP OVER TREE & LOOSEN BOTTOM ROOTS
ARM OF ROOT HOLDER
HEART WOOD
PICKING SOIL FROM BETWEEN ROOTS
BUNDLE OF ROOTS TIED TO RADIATING ARMS OF ROOT HOLDER OUT OF WAY OF WORKMEN
BUNDLES OF FINE FEEDING ROOTS
SAP WOOD
PICKING SOIL FROM BETWEEN ROOTS WITH FORK
SUB SOIL

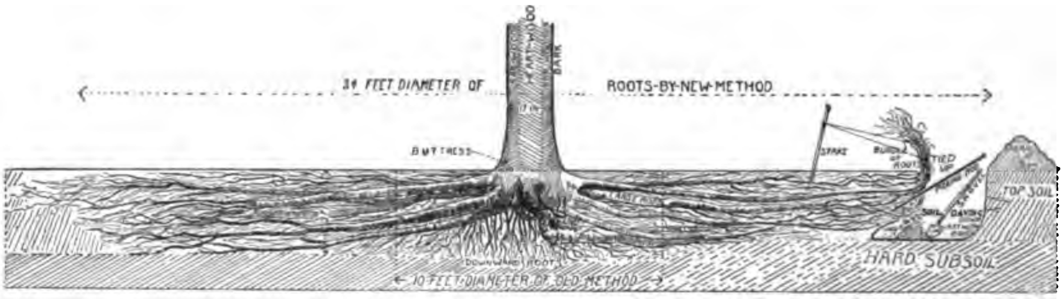
2549. Diagram to illustrate the operations in the removal of a large tree for transplanting.

vious to moving, all or part way around the tree at a diameter less than the size of the ball to be moved, is beneficial. With very large balls, freezing aids in keeping the soil solid, although it destroys the fine roots outside the ball.

Evergreens may be moved any month in the year. In June and July, the new growth is likely to wilt more than in August, after it has hardened. It is well to protect from deep freezing and drying winds in winter.

HENRY HICKS.

Another View of Transplanting Large Trees.—The modern demand for immediate effect in landscape work has been met by the successful transplanting of large trees. The method employed about Chicago differs somewhat from that in vogue in the east. This is due to a considerable degree to the condition of the soil in which the trees are found.



2550. Diagram to show how and where the digging is begun.

Select a shapely tree with well-balanced crown and which has stood in the open so that all its branches are equally thrifty. A bushy top is preferred that the necessary amount of trimming can be done by thinning out whole branches and not disturbing the terminal shoots, thus preserving the original outline of the tree. Crowded forest trees are too tall and it is difficult to get the sap to carry to the top.

A light sandy soil often produces fibrous roots spreading over a large area, but this generally slips off in transplanting and, if frozen, cracks badly when the ball is rolled. When resetting a tree, care must be taken to sift in new soil between the fine hair-roots and get it in direct contact with each rootlet, because if crowded together the roots are likely to rot. When practicable, it is undoubtedly best to move the roots in their native soil. A hard ball can be rolled at will and easily supports the weight of the trunk, which otherwise would crush the roots when rolled or handled. The prevailing soil about Chicago is two feet of rich black loam and a subsoil of clay. This is ideal for giving plenty of fibrous roots near the trunk, and a body to the ball of earth encasing the roots, without waiting for the ground to freeze. This allows a longer planting season and makes it easy to have loose soil to tamp around the tree.

After the tree has been dug loose, rock back and forth, filling under it each time with soil, until the whole ball is standing flush with the surface. It depends upon the weight of the load what style of a wagon is to be used. A hardwood tree of thirty inches in diameter weighs, with proper ball, about fifteen tons. This is the limit of practical construction for a low-hung stone truck. Simply pull the tree over and rest it on the high support over the rear axle and with block and tackle roll the ball on the wagon. When at the desired location roll off again, letting the ball rest on the ground before dropping into the hole. A counter check should be maintained to keep the tree always under control. Straighten up and thoroughly tamp so as to anchor it well and the work is complete.

WM. A. PETERSON.

TRÀPA (name explained below). *Onagràceæ. Trapa natans*, the WATER CHESTNUT or WATER CALTROPS, is an interesting plant for the aquarium. It has two kinds of leaves. The submerged ones are root-like, long, slender and feathery. The floating lvs. form a loose rosette. The leaf-stalks are swollen and spongy near the apex. The fruit is about ¾ in. across and has 4 spinescent angles. It is roasted and eaten in some parts of Europe like the common chestnut. The Indian species, *T. bispinosa*, is said to yield very large and sweet nuts which are commonly sold in the East under the name of Singhara Nut. The name Trapa is abbreviated from *calcitrapa*, which is the same as caltrops, an instrument of war used to impede the progress of mounted warriors. It had 4 spine-like projections, like the fruit of the Water Caltrops.

Generic characters: fls. small, axillary, solitary, short-peduncled: calyx 4-parted, the segments persistent, sometimes spinescent; petals and stamens 4 ovary 2-loculed; ovules solitary, long, pendulous, affixed to the septum: fr. top-shaped, leathery or somewhat bony, 1-loculed, 1-seeded. About 5 species, native to the warmer parts of the eastern hemisphere.

nàtans, Linn. WATER CHESTNUT. WATER CALTROPS. JESUIT'S NUT. Petiole of floating lvs. 2–4 in. long, nearly glabrous: blade rhombic-orbicular, dentate in upper half, slightly villous along the nerves beneath: fr. 4-spined, but the 2 lateral ones shorter. Eu., Orient. Gn. 24, p. 557. G.C. II. 10:212. B.R. 3:259.

bispinòsa, Roxb. SINGHARA NUT. Petiole of floating lvs. 4–6 in. long, woolly: blade 2 x 3 in., slightly crenate in the upper half, very villous beneath: fr. ¾ in. thick, with 2 of the spines sometimes absent. India, Ceylon.

W. M.

Trapa natans is one of the daintiest aquatics in cultivation. It is perfectly hardy and very desirable for aquaria, pools, ponds or tub culture. Its beautifully mottled or variegated foliage is very attractive. The flowers are white, small and inconspicuous. The fruits are very large in comparison with the flowers and leaves, but they are hidden beneath the foliage until they ripen, when they drop off. They are good to eat raw, like chestnuts, and are sweeter and more palatable before the shell becomes hard. The nut is not likely to become of commercial importance in America. The seeds drop from the plant and remain in the pond all winter.

WM. TRICKER.

TRAUTVETTÈRIA (Trautvetter, a Russian botanist). *Ranunculàceæ.* A genus of but two species of North America and eastern Asia. Tall, erect, perennial herbs: lvs. broad, palmately lobed: fls. white, small, corymbose-paniculate; sepals 3 to 5, caducous; petals none; carpels many, forming 1-seeded akenes. Very hardy, thriving in ordinary or rich soil. Propagated by division of roots. Offered by dealers in native plants.

Carolinénsis, Vail. (*Hydrástis Carolinénsis*, Walt. *T. palmàta*, Fisch. & Mey.). Stems 2–3 feet high: lvs. alternate, reticulated, radical ones very large, with lobes much toothed and cut. July. Pa., south and west. B.M. 1630 (as *Cimicifuga palmata*).

grándis, Nutt. (*Actæa palmàta*, Hook. *A. grándis*, Dietr.). Much like the above species. Lvs. membranaceous, more deeply lobed, often to the base, thin, sparsely hairy beneath along the ribs; reticulations less distinct: styles longer and somewhat curled. Wash., Idaho, Brit. Col.

K. C. DAVIS.

TRAVELER'S JOY. *Clematis vitalba.*

TRAVELER'S TREE. See *Ravenala.*

TREASURE VINE. Name proposed by J. L. Childs for *Hidalgoa Wercklei* or *Childsia Wercklei.*

TREE. Candelabrum, or **Chandelier T.,** *Pandanus Candelabrum.*

TREE OF HEAVEN. See *Ailanthus.*

TREES. Plate XLIV. Figs. 2551–2566. What is a tree? is a question to which it is not easy to give a short and well-defined answer. The same species may assume a tree-like habit or remain shrubby, according to the climatic conditions, soil and other circumstances. Usually a tree is defined as a woody plant rising from the ground under normal conditions with a single stem and attaining a certain height, fixed by some at 20, by others at 15 feet, or even less. A more exact definition has been given by B. E. Fernow: "Trees are woody plants the seed of which has the inherent capacity of producing naturally within their native limits one main erect axis continuing to grow for a number of years more vigorously than the lateral axes and the lower branches dying off in time."

2551. A pasture elm.

Trees are the most prominent feature of the vegetable world and surpass all other organic beings in height, magnitude and longevity. The greatest height known has been reached by *Eucalyptus amygdalina* of Australia, of which trees have been observed that were 470 feet high. In length, but not in body and longevity, even this tree is surpassed by some giant floating algæ said to attain the length of 900 feet, and by some climbing palms of Java attaining, sometimes, 600 feet. Following *Eucalyptus amygdalina* is probably *Sequoia sempervirens*, which attains 325 feet and occasionally more. The Sequoias are of more majestic and gigantic appearance than the Eucalyptus on account of its massive trunk (see *Sequoia*, p. 1660). *Pseudotsuga Douglasi* and *Pinus Lambertiana* occasionally attain 300 feet. A number of other conifers, chiefly American, grow to a height of 150 to 300 feet. Some deciduous trees, as *Platanus occidentalis*, several species of oak and *Liriodendron Tulipifera* exceed 150 feet in height. The jequitibá of Southern Brazil (*Couratari legalis*, one of the Myrtaceæ) is also a gigantic tree (see Bot. Gaz. 31, p. 352).

The greatest diameter has been observed in *Castanea vesca*, of which a tree with a partly decayed trunk at the foot of Mt. Etna in Sicily measures more than 60 feet in diameter. After this the greatest diameter observed is in *Taxodium mucronatum*, about 40 feet, and in *Platanus orientalis* about the same, in *Sequoia gigantea* 35 feet, in *Taxodium distichum* 30 feet, and somewhat less in *Adansonia digitata.*

The age attributed to many of the tallest trees is based more or less on speculation, and opinions often differ widely. *Dracæna Draco* is believed to reach 6,000 years of age, *Adansonia digitata* 5,000, *Taxodium mucronatum* and Platanus 4,000, *Cupressus sempervirens* and *Taxus baccata* 3,000, *Castanea sativa*, *Quercus pedunculata*, *Sequoia gigantea* and *Cedrus Libani* more than 2,000 years.

Although the trees are the most conspicuous features of the vegetable kingdom, they represent only a small percentage of it as regards the number of species. In the United States, where about 550 trees occur, they represent only about 3½ per cent of the whole phanerogamic flora, in Europe even less. As a rule, towards the tropics the number of tree-like species increases, towards the arctic regions it decreases. Remarkably rich in trees is the flora of Japan, where the proportion of trees to the whole phanerogamic flora is more than 10 per cent, which percentage surpasses by far that of any other country in the temperate regions.

Trees belong to many different natural orders, but of the orders of monocotyledonous plants only a few contain trees and none of them is hardy north. None of the larger orders contains trees only, but there are some which consist exclusively of woody plants and include a large proportion of trees, as Coniferæ, Cupuliferæ, Salicaceæ, Juglandaceæ, Magnoliaceæ, Sapindaceæ, Elæagnaceæ, Urticaceæ, Hamamelidaceæ, Lauraceæ, Anacardiaceæ, Ebenaceæ, Styracaceæ and others.

The uses of trees are manifold, and a country from which the forests have been destroyed becomes almost uninhabitable and worthless to mankind. The forests furnish wood and timber, exercise beneficial influences on the climate, act as regulators of the waterflow, prevent erosion and also the removal of soil by the wind. Besides furnishing wood and timber, many trees yield other products of great economic importance, especially the numerous kinds bearing fruits. The esthetic value also of the tree must not be underrated, though it cannot be counted in money.

The science of trees and shrubs is dendrology. The art of growing trees is arboriculture, of which sylviculture is a branch and deals with the rearing and maintaining of forests and the producing of wood crops. Orchard culture is a branch of arboriculture or of horticulture and deals with the cultivation of fruit trees; it is usually included under pomology, which comprises both the science and practice of fruit-growing. As ornamental subjects, trees are more permanent, easier of cultivation and cheaper in the long run than herbs. It is curious to note how little attention the average gardener who has the care of a park or garden gives to the most prominent feature of his domain. He usually knows fairly well the greenhouse plants and his herbaceous perennials, which cost most in time and money, but the trees and shrubs he often hardly deigns to look at. This is apparently due to the fact that after being once planted, and often not by himself, the trees and shrubs do not need his perpetual care and usually grow without his aid and interference.

2552. A group of old sugar maples, with irregular and broken heads.

To the landscape gardener a thorough knowledge of trees is absolutely essential. He ought to know the ornamental properties of the trees, their rate and mode of growth, their peculiarities in regard to soil, situation and climate. As the trees are, after the surface of the ground, the most permanent element of the landscape, they ought to be planted with careful deliberation as to the intended artistic effect and their fitness to the soil and climatic conditions, for mistakes in planting of trees are afterwards not easily corrected and rarely without injury to the original artistic design. The available number of trees from which selection may be made is large. There are in American and European nurseries and gardens more than 600 species in cultivation which are hardy in the northern and middle states. About 240 of them are American, almost 200 from eastern Asia, about 100 from Europe and 70 from western and central Asia. About 40 natural orders are represented, of which the most important are the Coniferæ, Cupuliferæ, Salicaceæ, Rosaceæ, Leguminosæ, Juglandaceæ, Sapindaceæ, Urticaceæ, Magnoliaceæ and Oleaceæ. The number of all the cultivated varieties and garden forms is, of course, considerably larger than that of the botanical species and may be estimated at about 3,000. Comparatively few horticultural varieties are found in American nurseries as compared with European, but this need not be regretted, as horticultural varieties are mostly merely curious or monstrous forms. In planting, one must rely chiefly on the types and use the horticultural varieties sparingly, for restfulness should be the prevailing character of the masses and groups of trees.

The fundamental purposes of trees in landscape gardening are to furnish the great masses of foliage which frame and divide and partly constitute the views and landscape pictures, to emphasize the elevations of the ground, to vary the sky-line, to screen or block out unsightly objects, to enhance the beauty of buildings, and to furnish shade and shelter. The enjoyment the trees give by beautiful flowers, various foliage, splendid autumnal tints, and ornamental fruit is more incidental, though of great value and worthy of careful consideration. The trees should be selected for planting in accordance with the natural and intended character of the scenery and not be taken indiscriminately because they happen to be handy and easy to procure.

It is essential that the trees should be well adapted to the climate and soil, and in this respect a careful observation of the natural tree growth of the locality will give many good hints. Other considerations are the height the trees attain, the character of growth, color and effect of foliage, flowers and fruits, autumnal tints and winter effects. Concerning the general rules which govern the selection of trees for planting and which are principally the same as in herbs and shrubs, much other information may also be found in the articles on *Landscape Gardening*, *Park*, *Shrubbery* and *Herbs*.

Selections of Trees for Special Purposes.—The following lists include trees of proved hardiness and are not intended to be complete but merely suggestive, and chiefly for the northeastern states.

1. Trees with Showy Flowers.

A. *Blooming in early spring before or with the leaves.*

Acer rubrum (fls. blood-red).
Amelanchier Canadensis (fls. white).
Cercis Canadensis (fls. rosy pink).
Cornus florida (fls. white, also pink).
Cornus Mas (fls. yellow).
Magnolia Yulan (fls. white).
Magnolia Soulangeana (fls. white to purple).
Prunus Avium and other cherries (fls. white).
Prunus Americana and other plums (fls. white).
Prunus Davidiana (fls. pink, also white, the earliest of all Prunus).
Prunus pendula (fls. pinkish, branches pendulous).
Prunus Pseudocerasus (fls. white to pink).
Pyrus baccata and other species (fls. white to pink).
Salix (staminate plants with yellow catkins).

AA. *Blooming late in spring after the leaves.*

Æsculus Hippocastanum and other species (fls. white or red).
Catalpa speciosa (fls. white).
Cladrastis tinctoria (fls. white).
Cornus Kousa (fls. white).
Cratægus (fls. white).
Fraxinus Ornus (fls. white).
Laburnum (fls. yellow).
Magnolia hypoleuca (fls. white).
Pterostyrax (fls. white).
Robinia (fls. white or light pink).
Syringa vulgaris (fls. white to purple).
Tamarix parviflora (pink).

AAA. *Blooming in summer and autumn.*

Aralia Chinensis and spinosa (fls. Aug. and Sept.).
Castanea Americana (fls. white; July).
Gordonia pubescens (fls. white; Sept., Oct.).
Kœlreuteria paniculata (fls. yellow; July, Aug.).
Oxydendrum arboreum (fls. white; July, Aug.)
Rhus semialata (fls. white; Aug., Sept.).
Robinia Neomexicana (fls. light pink; Aug.).
Sophora Japonica (fls. white; Aug.).
Syringa Japonica (fls. white; July).
Tamarix Gallica (fls. pink; Aug., Sept., if severely cut back).

2. Trees with Showy Fruits.

Acer rubrum (fr. bright red in May and June).
Ailanthus glandulosa var. erythrocarpa (fr. red).
Cornus florida (fr. scarlet).
Cratægus coccinea and others (fr. scarlet or red).
Hippophaë rhamnoides (fr. yellow).
Ilex opaca (fr. red).
Magnolia hypoleuca (fr. scarlet).
Magnolia tripetala (fr. pink).
Pyrus baccata and allied species (fr. yellow or scarlet).
Rhus Cotinus (ample feathery panicles).
Rhus typhina (fr. scarlet).
Sassafras officinalis (fr. dark blue with red stems).
Sorbus Americana and Aucuparia (fr. red).
Taxus baccata (fr. scarlet).

3. Trees Valued for Foliage Effects. (See also Section 5, Evergreens, below.)

A. *With colored foliage.*

Acer Negundo, var. argenteo-variegatum (the most effective of hardy variegated trees).
Acer Negundo, var. aureo marginatum (lvs. yellow).
Acer palmatum, var. atropurpureum (lvs. purple).
Acer platanoides, var. Reitenbachi (lvs. becoming dark red in summer).
Acer platanoides, var. Schwedleri (lvs. bright red in spring).
Acer Pseudoplatanus Worleei (lvs. yellowish).
Betula alba, var. purpurea (lvs. purple).
Fagus sylvatica, var. purpurea (lvs. purple).
Populus alba, var. nivea (lvs. white beneath).
Populus deltoides, var. aurea (one of the best yellow-leaved trees).
Quercus pedunculata, var. atropurpurea (lvs. purplish).
Quercus pedunculata, var. Concordia (lvs. yellowish).
Salix alba, var. argentea (lvs. silvery white).
Tilia tomentosa (lvs. white beneath).
Ulmus campestris, var. argenteo-variegata (lvs whitish).

AA. *With large, bold foliage.*

Acer insigne.
Acer macrophyllum.
Aralia Chinensis and spinosa.
Asimina triloba.
Catalpa speciosa.
Magnolia macrophylla.
Magnolia tripetala.
Paulownia imperialis.
Quercus dentata.

AAA. *With small narrow or finely cut foliage.*

Acer palmatum, var. dissectum.
Acer platanoides, var. Lorbergi.
Acer saccharinum, var. Wieri.
Alnus glutinosa, var. imperialis.
Betula alba (cut-leaved).
Elæagnus angustifolia.
Fagus sylvatica, var. asplenifolia.
Gleditschia triacanthos.
Gymnocladus Canadensis.
Hippophaë rhamnoides.
Juglans regia, var. laciniata.
Quercus pedunculata, var. filicifolia.
Salix nigra.
Sambucus nigra, var. laciniata.
Tamarix Gallica, etc.
Taxodium distichum.

4. Trees with Brilliant Autumnal Tints.

Acer rubrum (scarlet).
Acer saccharum (scarlet and orange).
Cornus florida (scarlet).
Cercidiphyllum (yellow and purple).
Cratægus (mostly scarlet and orange).
Fraxinus Americana (yellow or violet-purple).
Liquidambar (scarlet).
Liriodendron (bright yellow).
Nyssa sylvatica (scarlet).
Oxydendrum arboreum.
Quercus alba (vinous purple).
Quercus coccinea, palustris (scarlet).
Rhus (mostly scarlet).
Sassafras (orange and scarlet).

5. Evergreen Trees

A. *Conifers* (see also Vol. 1, p. 358).

Abies.
Chamæcyparis.
Juniperus Virginiana.
Picea.
Pinus.
Pseudotsuga.
Thuya.
Tsuga.

AA. *Broad-leaved evergreens* (only Ilex opaca and Rhododendron hardy north).

Ilex opaca.
Magnolia glauca (not fully evergreen as far north as it is hardy).
Magnolia grandiflora.
Persea Carolinensis.
Prunus Caroliniana.
Prunus Lusitanica.
Quercus Virginiana.
Rhododendron maximum.

6. Deciduous Trees Valued for Their Winter Effects.

Acer Negundo (branches light green).
Acer Pennsylvanicum (striped bark).
Betula nigra (flaky reddish brown bark).
Betula papyracea (smooth, silvery white bark).
Cratægus viridis (red fruit).
Fagus sylvatica (keeps its dead leaves).
Gleditschia (large, flat pods).
Hippophaë rhamnoides (yellow berries).
Liquidambar (corky branches).
Pyrus prunifolia (scarlet or yellow fruit).
Quercus alba, pedunculata and tinctoria (keep their leaves).
Quercus macrocarpa (corky branches).
Rhus typhina (scarlet fruit).
Salix vitellina (yellow branches).
Sorbus Americana and Aucuparia (scarlet fruit).

7. Very Tall Trees.

Gleditschia triacanthos.
Juglans nigra.
Liriodendron Tulipifera.
Picea excelsa.
Pinus Strobus.
Platanus occidentalis.
Populus balsamifera.
Populus deltoides.
Quercus macrocarpa.
Quercus palustris.
Quercus rubra.
Quercus velutina.
Taxodium distichum.
Ulmus Americana.

8. Columnar or Narrow Pyramidal Trees.

Abies (most species).
Acer nigrum, var. monumentale.
Betula alba, var. fastigiata.
Carpinus Betulus, var. fastigiata.
Chamæcyparis Lawsoniana.
Chamæcyparis Nutkaensis.
Juniperus communis, var. Suecica.
Juniperus Virginiana (especially var. pyramidalis).
Liriodendron Tulipifera, var. pyramidalis.
Picea (most species).
Populus alba, var. Bolleana.
Populus nigra, var. Italica.
Quercus pedunculata, var. pyramidalis.
Taxodium distichum (especially var. imbricarium).
Taxus baccata, var. fastigiata.
Thuya.
Ulmus campestris, var. monumentalis.
Ulmus scabra, var. fastigiata.

9. Weeping Trees.

Acer saccharinum, var. Wieri.
Betula alba, var. pendula.
Fagus sylvatica, var. pendula.
Fraxinus excelsior, var. pendula.
Fraxinus parvifolia, var. pendula.
Prunus pendula.
Prunus serotina, var. pendula.
Quercus pedunculata, var. Dauvessei.
Salix vitellina, var. pendula.
Salix Babylonica.
Salix blanda.
Sorbus Aucuparia, var. pendula.
Tilia petiolaris.
Ulmus scabra, var. pendula.

10. City Trees (See also No. 11).

Ailanthus glandulosa (pistillate tree).
Carpinus.
Cratægus Oxyacantha.
Fraxinus Americana.
Fraxinus excelsior.
Ginkgo biloba.
Gleditschia triacanthos.
Platanus orientalis.
Populus deltoides.
Populus nigra, var. Italica.
} (often attacked by borers).
Prunus serotina.
Robina Pseudacacia (often attacked by borers).
Sophora Japonica.
Ulmus Americana.
Ulmus campestris.
Tilia ulmifolia.

11. Shade and Avenue Trees.

Besides the trees enumerated under city trees, No. 10 (which are to be recommended as street trees in the cities), the following trees are good avenue subjects:

Acer platanoides.
Acer rubrum.
Acer saccharinum.
Acer saccharum.
Æsculus carnea.
Æsculùs Hippocastanum.
Catalpa speciosa.
Celtis occidentalis.
Fagus ferruginea and F. sylvatica.
Liquidambar styraciflua.
Liriodendron Tulipifera.
Quercus alba.
Quercus coccinea
Quercus imbricaria.
Quercus palustris.
Quercus Phellos.
Quercus rubra.
Tilia Americana.
Tilia dasystyla.
Tilia ulmifolia.

12. Trees for Seaside Planting.

Ailanthus glandulosa.
Cratægus Oxyacantha.
Elæagnus angustifolia.
Hippophaë rhamnoides.
Juniperus Virginiana.
Picea alba.
Pinus Laricio.
Pinus rigida.
Pinus sylvestris.
Populus deltoides, var. Carolinensis.
Populus tremuloides.
Quercus rubra.
Salix alba.
Salix Caprea.
Sassafras officinale.
Tamarix.

13. Trees for Dry Situations and Dry Climates.

Acer campestre.
Acer Ginnala.
Alnus rugosa.
Betula alba.
Cornus Mas.
Elæagnus angustifolia.
Fraxinus pubescens.
Phellodendron Amurense.
Pinus divaricata.
Pinus rigida.
Pinus sylvestris.
Quercus coccinea.
Quercus rubra.
Quercus Prinus.
Quercus velutina.
Ulmus effusa.

14. Trees for Wet Soil.

Acer rubrum.
Acer saccharinum.
Almus glutinosa.
Almus maritima.
Betula alba.
Betula nigra.
Chamæcyparis sphæroidea.
Hicoria laciniosa.
Nyssa sylvatica.
Picea alba.
Picea nigra.
Pinus rigida.
Populus (most species).
Quercus alba.
Quercus bicolor.
Quercus palustris.
Quercus Phellos.
Salix (most species).
Taxodium distichum.

Alfred Rehder.

Ornamental Trees for the Middle Southern States. I. Deciduous Trees. *Acer saccharinum* (*A. dasycarpum*) and *A. Negundo*, the latter extensively used for street planting. — *Broussonetia papyrifera*, formerly planted along streets, but objectionable because of the many suckers which they produce, as is also B. Kazinoki. — *Cercis Canadensis*. Valuable as an early spring-flowering tree. — *Celtis Bungeana*. One of the most distinct trees: an excellent shade tree. — *Catalpa*. Seldom planted south as an ornamental tree, because of the repeated attacks of caterpillars. The latter are frequently used for fish bait.—*Cladrastis tinctoria*. Very desirable as a flowering lawn tree.—*Cornus florida*. The white-flowering species is among the most attractive of our early spring-blooming trees and is largely used in landscape work. The pink- and red-flowering forms are exceedingly beautiful.—*Cratægus*. Taking into account the various shapes, the foliage and the bright colored fruit in fall and winter, the best are: *C. cordata* or Washington Thorn, *C. arborescens*, *C. spathulata* and *C. æstivalis* or Apple Haw.—*Chilopsis saligna*, known as *C. linearis*, is one of the best for dry soils. The typical species produces lilac-colored flowers, but several forms have lately been produced with flowers ranging from light lilac to lilac-purple with yellow stripes inside. A pure white-flowering form is very striking but is of more dwarf habit.—*Diospyros Virginiana*. Sometimes planted for shade or for its fruit. Adapts itself to nearly all soils. There are many forms varying both in the foliage and size and shape of fruit.—*Fagus ferruginea* is frequently used for street planting in sandy soils. The red-leaved forms of the European species are of little value south, the purple tint of the foliage fading to a dull green at the approach of warm weather.—*Fraxinus acuminata* and *F. pubescens*. Both thrive best in rich soils and are very desirable for street planting, being seldom attacked by insects.—*Ginkgo* or *Salisburia* is sometimes used for avenues and street planting where a rigid pyramidal tree is required. The foliage is one of its attractions, being shaped like the Maidenhair fern.—*Gleditschia triacanthos*. The fertile tree is sometimes planted for its large falcate pods, which are relished by many for the saccharine acidulated pulp. The finely pinnate foliage is very ornamental.—*Halesia tetraptera*. In the middle sections of the South and in rich, dry soils it grows to a small tree, but in the mountain districts in rich soils along the water-courses, trees 40 to 50 feet high are frequently found. Valuable for landscape planting.—*Hicoria* or Carya. The pecan is the best southern nut tree and is very largely planted for its nuts. It is often planted in avenues for its beauty.—*Hicoria myristicæformis* is scarce, but its foliage is more attractive than that of any other species.—*Hovenia dulcis*. The foliage and the fleshy red peduncles in autumn make it an excellent shade and ornamental tree.—*Idesia polycarpa*. A handsome tree when grown in partial shade; the bark blisters in full sun.—*Juglans*. *J. nigra* is one of the most valuable ornamental and economic trees and is extensively planted for avenues. The Persian or English walnut and its many forms are being more largely planted than of old, but are often injured by late spring frosts following a warm period during February. *J. Sieboldiana* is a very ornamental tree and very productive at an early age. *J. cinerea* is suited only to the mountain regions of the South.—*Kœlreuteria paniculata*. Very desirable for its pinnate foliage and panicles of yellow flowers, which are succeeded by bladder-like fruits.—*Lagerstræmia Indica*. The Crape Myrtle is one of the most characteristic features of southern homes. It has become almost naturalized south. If trained to a single stem it will form a tree 25 to 30 feet high; otherwise it affects the bush form. It is conspicuous for its shining brown bark and the profusion of its beautifully crimped and fringed flowers, which are produced from April until August. The colors vary from a pale to a dark pink, purplish red, pure white and glowing crimson. No other flowering tree can surpass it in beauty, and by a judicious selection of the various colored flowers a grand effect is produced in landscape work.—*Liriodendron Tulipifera*. One of the most valuable and rapid-growing shade and ornamental trees; thrives best in rich soil. Trees taken from woods transplant badly. They should be grown in nursery and occasionally transplanted until sufficiently large for using in street planting.—*Liquidambar*. A most symmetrical shaped tree; adapts itself to all soil; valuable for street planting. Some trees assume a deep purple or crimson tint in the foliage during autumn, others a golden yellow.—*Magnolia*. Of the native deciduous species, *M. acuminata* is the most desirable for street and avenue planting. All the species are voracious feeders and thrive best in rich soils. *M. macrophylla*, or Umbrella Magnolia, seldom grows beyond 25 feet, but is conspicuous for the length and size of its leaves. This tree is called Umbrella Tree south, whereas this name applies to *M. tripetala* at the North. *M. Fraseri*, Ear-leaved Magnolia or Wahoo of the western North Carolina mountaineers, is also a very ornamental tree. M. tripetala is objectionable in gardens owing to the unpleasant odor of its flowers. Few Chinese species, with the exception of *M. hypoleuca*, attain the size of a tree. *M. Yulan* and *M. Soulangeana* can be trained to a single stem and made to attain a height of 15 feet. All the other varieties may be classed as shrubs. The flowers are often injured by late spring frosts.—*Melia Azedarach* (Pride of India, Chinaberry). Almost naturalized south. It is of very rapid growth and begins to flower at an early stage. The flowers are delightfully fragrant with the perfume

2553. A pasture maple, in autumn, showing the strong framework.

2554. A tree growing in the open, with full rounded head.

of the lilac. Extensively planted for shade trees. The umbrella form, known as Texas Umbrella, assumes a dense, spreading head with drooping foliage. It is of unique appearance and can be used with great effect in landscape work.—*Morus*. *M. rubra* is frequently planted for shade; it is valuable for its wood, which is of great durability for posts. *M. alba* is naturalized in many sections. A form of *M. rubra* discovered in middle Georgia some years ago and called Stubbs from the discoverer, produces enormous crops of large, rich vinous fruit. This and the Hicks and Multicaulis (latter of Chinese type) are often planted for feeding poultry and hogs. They should not be planted near dwellings, owing to the dropping of the fruit.—*Nyssa sylvatica*. Only desirable in landscape work for the brilliant red tint of its autumn foliage.—*Oxydendrum arboreum*. Desirable for its flowers and highly colored autumn foliage.—*Parkinsonia aculeata*. Retoma or Horse bean of southern Texas. A small tree with green bark, feathery foliage and yellow flowers. Valuable for shrubberies.—*Paulownia imperialis*. Rapid-growing. Almost naturalized in some sections of the South. The foliage in young trees is very large. Flowers pale violet, very fragrant, in long panicles; they open before the leaves appear.—*Peach*. There are many ornamental varieties which are exceedingly handsome while in bloom, especially the double-flowering crimson, white and pink; others are desirable for their peculiar growth, as Pyramidalis, which is as erect as a Lombardy poplar. Weeping, willow-leaved and golden-leaved varieties are interesting.—*Prunus*. Hortulana or Chicasaw plums are sometimes planted for ornament, though commonly for fruit. *P. Virginiana* is abundant everywhere but not valued owing to being usually infested with tent caterpillars. *Prunus Pissardi* is the best purple-leaved tree for the South, as it retains its color during summer.—*Pinckneya pubens*. This very ornamental small tree is seldom seen under cultivation, as it grows naturally in wet and boggy soils.—*Pyrus coronaria*. The crab apple, a small tree with very fragrant flowers in spring, is excellent for shrubberies.—*Platanus occidentalis*. One of the most desirable trees for street planting.—*Populus*. The variety which is of greatest value for street planting is *P. deltoides* or *monolifera*, commonly known south as cottonwood. It is of rapid growth and grows in nearly all soils that are not too arid. All southern nurserymen catalogue the Carolina Poplar, but the stock is not always true to name.—*Pterocarya fraxinifolia*, or Caucasian Wing-fruited Walnut, is a very rapid-growing tree, with spreading branches and pinnate foliage. Very ornamental when covered with pendulous racemes of small winged nuts, which, however, are of no economic value.—*Quercus*. Nearly all the species of the middle and eastern states are found more or less abundant in the middle South, but the most valuable purely southern species are as follows: *Q. Phellos*, or Willow Oak, with lanceolate leaves; *Q. aquatica*, or Water Oak, with leaves almost perennial, oblong and obtusely lobed. Both are largely planted for streets and shade, as they grow very rapidly and in almost any soil. *Q..falcata*, *Q. laurifolia*, *Q. Phellos* and *Q.Muhlenbergi* are desirable. *Q. Virginiana*, or Live Oak, is a very large tree, seldom exceeding 50 feet in height but covering a large circumference. It is native along the seacoast and adapts itself to inland sections, where it does not attain the great size of the coast region. There is no southern tree, except *Magnolia grandiflora*, that is more admired, especially when planted in avenues.—*Sapindus marginatus*. The globose yellow berries are retained during winter. Berries when boiled produce a saponaceous fluid.—*Stillingia sebifera*. Naturalized on the coast of Georgia and South Carolina. The acuminate rhomboidal leaves give the tree a unique appearance. Requires rich soil and is valuable in landscape work.—*Symplocos tinctoria*. Not common. Could be available for shrubberies.—*Tilia pubescens*. A large tree occasionally found in rich soils along the seacoast. Differs little in general from *T. Americana*, but seems to be better suited to the middle South. Very desirable for street planting or shade.—*Toxylon*, or *Maclura*, is naturalized in many sections of the middle South. Grows to a height of 30 feet and the fertile trees are very ornamental when laden with their large, globular fruit. The wood is very lasting when used for posts and takes a beautiful polish.—*Ulmus Americana* is perhaps more largely planted for streets and avenues than any other deciduous tree.—*Viburnum prunifolium* (Black Haw or Possum Haw). In very rich soils sometimes attains a height of 15 to 20 feet. The dark blue berries are retained during winter. Desirable for shrubberies.

2555. Apple, one of our most picturesque trees.

II. BROAD-LEAVED EVERGREEN TREES. *Camellia Japonica*. Although these magnificent plants are usually seen in bush form, they can be trained to single stems and attain a height of 20 or more feet in the coast region, where they have found a congenial soil and climate. The typical single red variety, a tree of which is growing at Charleston, S. C., and planted in 1808, being the first introduced, is now upwards of 20 feet high. The double-flowering sorts, while usually of vigorous growth, do not attain the size of the single red.—*Cinnamomum Camphora*. In southern Louisiana and middle Florida trees grow to a height of 50 feet; in the middle South they affect the bush form or when trained to single stems seldom exceed 15 to 20 feet. For the extreme South it is recommended for street planting.—*Cyrilla racemiflora*. Specimens are occasionally found on shady banks of streams, where the soil is very rich, that will grow 20 feet high, but the tree form must be secured by pruning. The foliage assumes a bright red or bronze tint in winter.—*Eriobotrya Japonica*. Flowers produced in January, and if not frost-killed are followed by a golden yellow plum-like fruit of good flavor. Reaches a height of 20 or more feet in the coast belt.—*Gordonia Lasianthus*. A stately tree found only in shallow swamps or turfy soils. The roots spread almost entirely near or upon the surface of the ground, which makes it difficult to transplant trees taken from the woods. Trees grown from seed in pots are best for planting, but a rich moist soil is necessary to their growth.—*Ilex*. *I. opaca* and *I. Dahoon* are among the most valuable evergreen trees, the former being the best where a large tree is desired. Specimens taken from the woods should not exceed one foot in height, as larger sizes almost always fail in transplanting.—*Ligustrum*. *L. Japonicum* often forms a tree 25 feet high. Berries blue-black, retained during winter.—

Plate XLIV. The framework of trees and bushes. To illustrate the article *Tree*.

Magnolia. *M. grandiflora* is justly considered the glory of southern broad-leaved evergreen trees. There are many forms, based on the size and shape of the leaves and the flowers. The superb white flowers, which are seen from May until August and occasionally upon some trees as late as October, vary from 4 to 12 inches in diameter. Thrives as far north as Washington, D. C. *M. glauca* has white flowers 2 to 3 inches in diameter and delightfully fragrant.—*Osmanthus fragrans*, var. *ruber* and *O. Aquifolium*, var. *ilicifolius*, can be trained to single stem. The flowers of the first are delicately fragrant and produced twice a year. — *Persea Carolinensis*. Planted for shade in rich soils in the coast belt. — *Photinia serrulata*, or Chinese Evergreen Thorn, has white flowers and dark red autumn foliage.—*Prunus Carolinensis*. Known south as Carolina Cherry, Carolina Laurel, Mock Orange, etc. One of the most ornamental southern trees.—*Quercus Suber*. Acorns were distributed by the U. S. Patent Office in 1860 and many large trees are now found in several sections of the South, where they have fruited. Some small plantations are made for the purpose of producing cork. It grows well in comparatively poor and stony soils. — *Sabal Palmetto* is now freely used for street and avenue planting on the coast. It is conspicuous for its tropical appearance. It is not successful further than 40 miles from the seashore.

III. Conifers or Narrow-leaved Evergreens.—*Abies*. Of this section few specimens are found below the Piedmont region. Occasionally the Norway spruce grows to a moderate size.—*Cedrus Deodara*. An admirable tree and of rapid growth, 40 to 50 feet. *C. Atlantica*. 25 to 30 feet.—*Cunninghamia Sinensis*. Foliage resembles an Araucaria.—*Cupressus*. *C. sempervirens* has many forms, from the compact, spiral or shaft-like shape to more spreading habit. *C. Lusitanica* or Cypress of Goa, has numerous forms with foliage of an ashy green and pendulous branches, to others of a more dark tint and rigid form. Of *Chamæcyparis Lawsoniana* there are endless forms, from a compact, erect habit and vivid green foliage to those of open or pendulous shape and with glaucous or golden foliage. *C. funebris* has varied less in its seedlings.—*Juniperus*. The Irish Juniper is of fine pyramidal form, and reaches a height of 15 feet. *J. excelsa*, *Chinensis* and *thurifera* differ in the tint of their foliage and are all of tall growth.—*Libocedrus decurrens*. The California arbor-vitæ, with its graceful feathery foliage and conical shape, is one of the most ornamental of conifers.—*Pinus*. Few of the exotic species are suitable to the South. *Pinus excelsa*, or Bhotan Pine, is undoubtedly the best adapted to the middle South of all kinds.—*Retinispora* is a valuable group of Japanese Cypress, but with the exception of *R. obtusa*, *Fullerii*, *plumosa* and *squarrosa Veitchii*, all are of dwarf habit.—*Thuya*. The Asiatic section is better adapted to the middle South than the American species. Of the former the best forms are known to nurseries as *Biota pyramidalis* and var. *aurea*, reaching a height of 15 to 18 feet. *B. Japonica*, var. *filiformis* (*Thuya orientalis*) is a remarkable variety, with thread-like foliage and compact habit to 10 to 12 feet.

In the foregoing list of Coniferæ no mention is made of species or varieties of low or shrub-like growth, such as Podocarpus, Cephalotaxus, Thuyopsis, and Sciadopitys, of which there are many good specimens in various parts of the south. Araucarias are also omitted, owing to their liability of failure from extreme heat or other unfavorable climatic conditions. This applies also to Sequoia, and Frenelas (properly Callitris); these frequently make an extraordinarily rapid growth until late in autumn, and are often injured by a cold wave early in winter.

P. J. Berckmans.

2556. Picturesque old apple trees.

Trees on the Great Plains.—The Plains are not absolutely treeless, as strangers often suppose, but the whole vast area is dotted here and there with small groves, or narrow belts which fringe the borders of the streams. The number of native species, however, is much smaller than in the rich tree flora of the northeastern United States. The number of species cultivated for shade and ornament, for a long time, at least, must be relatively small owing to climatic and other causes. In general the people of the Plains are necessarily more interested at present in planting trees for profit than for pleasure, but in the older parts are already to be found many fine public parks and private grounds. To a large extent, however, their point of view is that of forestry rather than horticulture.

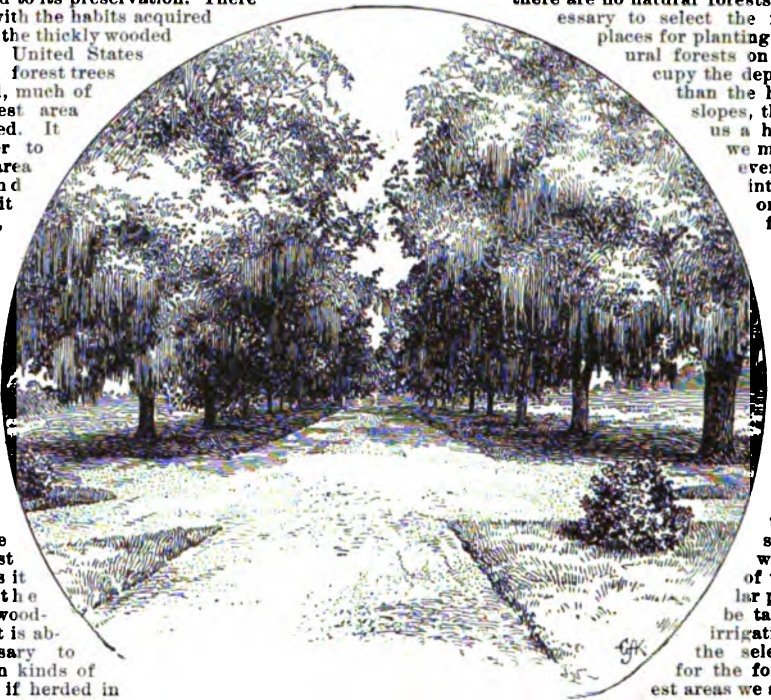
In studying the forest trees of the Great Plains of central North America we find that most of the species have migrated out upon the Plains from the great forest body of the Mississippi valley. These trees found their way upon the Plains by way of the forests which border the Missouri river and its tributaries. As we pass down the river, along the eastern edge of the Plains, the forest belt becomes larger and larger, until it eventually merges into the great body of forest trees lying on the easterly side of the Mississippi valley. The principal trees which have come upon the Plains by this route are the common red cedar, papaw, half a dozen willows, one cottonwood, basswood, two or three elms, hackberry, mulberry, three ashes, wild apple, four species of hawthorns, Juneberry, wild cherry, choke cherry, wild plum, coffee bean, honey locust, redbud, sycamore, two species of buckthorns, buckeye, one maple, box-elder, sumach, two species of walnuts, five or six hickories, nine or ten oaks, ironwood, blue beech, and one birch. But ten species of trees have come from the Rocky Mountain forests, and these have made much less impression upon the forests of the Plains than those which came from the eastern forests. In this list are the bull-pine, the western red cedar, four species of cottonwoods, the buffalo berry, a maple, and two birches.

Although the present forest area of the Plains is not relatively great, it is large enough to be seriously considered in regard to its preservation. There is danger that with the habits acquired by our people in the thickly wooded portions of the United States of cutting down forest trees wherever found, much of this small forest area will be destroyed. It is much easier to preserve an area of forest land than to create it anew. First, all forest fires must be kept down. Where a mass of woodland adjoins the open prairie, fire-guards should be made so that the fires will not sweep into the forest growth. The greatest destroyer of the forests of the Plains in the past has been fire, as it swept over the prairies into woodland. Second, it is absolutely necessary to keep out certain kinds of stock. Swine, if herded in large numbers, will inevitably destroy the trees. They prevent the growth of small trees, and eventually destroy those of larger growth. Cattle, in large numbers, are equally destructive. In fact, where the attempt is made to preserve uninjured the trees in a forest it is necessary to keep out stock of all kinds, excepting possibly during limited portions of the year. Third, it is necessary to cut out the trees for use with very great care. A forest should be a permanent crop, and the cuttings should be so made that the forest as a whole is not injured. Trees should be cut here and there in such a way that the young trees which are left have an opportunity for growing into usable timber.

Care should be taken to encourage the tendency to spreading which is so strong in nearly all parts of the Plains. With a little care every present living forest area may be made to extend itself spontaneously, or nearly so. The forest should be effectually inclosed by a fence placed at some distance from its outer border, leaving a belt of unoccupied land between the trees and the fence. This will grow up with weeds, and mingled with these will be the seedling trees springing from the seeds blown or carried from the forest area. In this way the border of the forest will be gradually extended. This can be helped by plowing up these inclosed belts of land, giving better opportunity for the starting of seedling trees. With the weeds and little trees will spring up low shrubs of various kinds. These need give no trouble, for this is merely nature's way of taking possession of the soil. Little if any cultivation need be given to such a nursery belt, as the weeds which spring up, while unsightly, will serve the useful purpose of sheltering the little trees, and eventually the trees will rise above, and choke them out. Grass, however, forming a tough sod, is harmful to the little trees, far more so than the ordinary weeds.

There are many places where actual planting must be resorted to. In looking about for a site for the new forest plantation, we must remember that the best conditions for tree growth are usually to be found near the natural forests. Where there are natural forests the planting should be around their borders, so as to extend them in much the same way as indicated in the preceding paragraph in regard to natural spreading. Where there are no natural forests at all it is necessary to select the more favorable places for planting. Since the natural forests on the Plains occupy the depressions rather than the hill-tops or the slopes, this should give us a hint as to what we must do. Wherever the land slopes into a depression one may find favorable conditions for growing trees. These depressions, generally called "draws," may be filled with trees, and when once a growth of a few acres is secured it will not be difficult to extend the forest far up the hillside slopes. On the western portions of the Plains similar positions should be taken under the irrigation ditches. In the selection of trees for the formation of forest areas we should also take a hint from nature. The rule, which is a very excellent one for the plainsman to follow, is to plant on his farm the kinds which he finds in the nearest forest, and to give his planted trees as nearly as possible the same conditions as those under which they grew in the native forest. On the eastern third of the Plains, the walnut, white oak, shell bark hickory, white elm, red elm, hackberry, white ash, wild cherry, catalpa and honey locust are recommended for planting. On the extreme eastern portions bordering the Missouri river, many more kinds can be planted, but as we pass westward toward the borders of the Sand Hill region the list grows smaller. On the central Plains the list is reduced, and also somewhat changed in species. The two elms may be planted, as also the hackberry, the green ash in place of the white ash, wild cherry, honey locust, and in many places the bull-pine. On the western Plains, especially that portion lying west of the main body of the Sand Hills, and having an elevation above the sea of from 3,000 to 4,000 feet, the list is still smaller. The white elm is still included, also the hackberry, the bull-pine, and in many places the red cedar.

The trees mentioned are of the more durable and profitable kinds. But on all parts of the Plains people



2557. Avenue of live oaks in Audubon Park, New Orleans.

must often have quick-growing trees which soon produce fuel, but which have little, if any, value for other purposes. In the eastern part of the Plains the black willow, almond willow, common cottonwood, silver maple, and box elder are useful trees for this purpose. We should not condemn the use of these easily grown soft-wooded trees. A forest is a crop, and there is no reason why a farmer may not plant a more quickly growing crop if he wishes, but he should at the same time plant the more enduring kinds given in the preceding lists. On the central Plains the quickly-grown trees may include the same willows and cottonwood and also the box elder. The silver maple will not do well in the greater part of this central region. On the western Plains the list is essentially the same as for the central portion: namely, the willows, cottonwood, and the box elder, to which may be added, here and there, one or more of the western species of cottonwood.

Now for the horticultural point of view. About the country homes the first trees are usually cottonwood, silver maple and box elder, followed later by green ash and white elm. Very commonly the red cedar is planted with the first mentioned species, and often Scotch and Austrian pines are soon added. It must be remembered that the settler's house on the Plains stands in the open instead of being hemmed in by forest trees, as in the eastern portions of the American continent. The settler's problem is to surround his house with trees, not to clear the trees away. In towns and cities the cottonwood, silver maple and box elder are generally the pioneer trees, since they produce a shade sooner than any others, and later these are gradually replaced by green ash and white elm. Hackberry, black walnut and buttonwood are occasionally planted with good success. The species which are most largely used for wind-breaks for orchards and other plantations are common cottonwood, willow (a variety of *Salix alba*), silver maple and box elder. The first mentioned, because of its easy propagation, rapid growth and extreme hardiness, is the favorite tree for this purpose. Where landscape gardening is attempted, the Scotch and Austrian pines, Norway spruce and red cedar are generally used, and to these are often added one or more species of the Rocky Mountain spruces. The most generally used deciduous tree for this purpose is the white elm (which here attains to a singular beauty of form and foliage), to which are occasionally added bur oak, black walnut and Russian olive (Elæagnus), and in proper situations, the white willow. The coniferous trees of greatest value for ornamental purposes on the Plains are the Austrian pine, Scotch pine and red cedar. With proper care these may be grown on all parts of the Plains where water enough to maintain life may be obtained. On the extreme eastern border the Norway spruce and even the balsam fir have proved valuable. Among deciduous trees the white elm holds first place, followed by the hackberry (which is not as much planted as it deserves) and the green ash.

2558. A tree group dominated by a leaning oak, which is a remnant of the forest.

2559. Two types of conifers — pine and spruces.

C. E. Bessey.

Trees Grown for Shade and Ornament in California. — The mild and equable climate of California allows a wide range of available species from which to select trees for shade, ornament and shelter. On account of the long rainy season, the low humidity of the atmosphere, and the relatively high mean, and freedom from low winter minima in temperatures, the trees which thrive best in middle California are those indigenous to the arid and semi-arid warm-temperate regions of the globe, e. g., southern Australia, the Mediterranean region, South Africa, northern Mexico and Chile. Many trees of the temperate humid regions also thrive in this state, particularly in the relatively humid climate of the coast, and are offered by our nurserymen. Several of the species mentioned in this list are not described in this Cyclopedia, as they did not appear to be in the general trade when the pages were written.

I. The Species Most Extensively Planted. — The three following are the trees most frequently met with as shade and ornamental trees in middle California:

1. Eucalyptus Globulus.
2. Cupressus macrocarpa.
3. Pinus radiata.

The relative abundance of the succeeding species is only approximately indicated by their sequence.

4. Robinia Pseudacacia, probably more widely distributed and occurring in more remote and out-of-the-way places than any other species (except, perhaps, *Eucalyptus Globulus*). The seeds may have been brought across the Plains by the earliest settlers at the mines.
5. Melia Azedarach, var. umbraculiformis.
6. Phœnix Canariensis.
7. Schinus Molle.
8. Acacia melanoxylon.
9. Acacia mollissima.
10. Magnolia grandiflora.
11. Populus deltoides, var. Carolinensis.
12. Washingtonia robusta.
13. Cordyline australis and other species.
14. Araucaria Bidwillii.
15. Araucaria excelsa.
16. Grevillea robusta.
17. Juglans Californica and spp.
18. Ulmus racemosa and spp.
19. Acer Negundo and var. Californicum.
20. Salix Babylonica.

21. Eucalyptus robusta.
22. Eucalyptus viminalis.
23. Eucalyptus rostrata.
24. Acer saccharinum.
25. Pittosporum spp.
26. Washingtonia filifera.
27. Betula alba.
28. Cedrus Deodara.

II. **Trees Being Most Extensively Planted at the Present Time.**—The following list, arranged in sequence according to the actual number of sales made during the planting season of 1900–1901, is compiled from data furnished by John Rock, of the California Nursery Company, at Niles. The percentages refer only to the seventeen species here enumerated, and not to the total number of trees sold by the nursery, which has a large and varied assortment of species many of which are more suitable and more effective than those for which there is, at present, the greatest demand.

	Per cent.
1. Eucalyptus Globulus	35.24
2. Cupressus macrocarpa	26.43
3. Eucalyptus viminalis	15.00
4. Pinus radiata	4.07
5. Melia Azedarach, var. umbraculiformis	2.75
6. Phœnix Canariensis (Fig. 2565)	2.71
7. Acacia melanoxylon	2.20
8. Acacia mollissima	1.76
9. Robinia Pseudacacia	1.65
10. Magnolia grandiflora	1.65
11. Acer saccharinum	1.43
12. Juglans Californica	1.14
13. Acer Negundo, var. Californicum	.89
14. Populus deltoides Carolinensis	.81
15. Ulmus Americana	.81
16. Betula alba	.81
17. Washingtonia filifera	.65
	100.00

III. **Selections for Special Purposes.**—The diversity of choice, rendered possible by the extent of desirable material that is available, makes it somewhat difficult to readily select the most suitable species for various specific purposes. The following classified lists are intended as suggestions to aid in making a suitable selection; they are almost entirely restricted to species offered in the Californian trade, and are intended to be suggestive only, and not by any means complete. New species and varieties are constantly being added to the nursery stocks, some of which will be found particularly well adapted to certain conditions of climate and soil, and will doubtless replace others now in use.

2560. Picturesque field pine, remnant of a forest.

2561. Leaning tree in a clearing, showing its effort to regain itself by producing upright branches.

1. *For Subtropical Effect.*—That there is in California strong appreciation of subtropical effects in gardening is shown by the great demand for dracænas and such large-leaved plants as palms, magnolias, bananas and rubber-trees. That the effect produced by the planting of such trees so often fails to be satisfactory is largely due to one or both of two causes,—either unsuitable location of the specimens or choice and association of unsuitable species. To prevent a repetition of the first-named error, the prospective tree-planter is recommended to consult the article on Landscape Gardening in Volume II; and to avoid the second, a selection from the following list is suggested, with the addition of such large-leaved herbaceous plants as cannas, colocasia, cynaras, funkias, *Gunnera scabra*, pampas grass, veratrums, agaves, yuccas, aloes, *Woodwardia radicans* and *Rodgersia podophylla*, together with such shrubby plants as bamboos, giant reed, the choicer varieties of castor-bean, *Senecio grandifolius*, *Polygonum Sachalinense* and *P. Sieboldi*.

A. *Small Trees or Tall Shrubs.*

Acanthopanax ricinifolium,
Aralia Chinensis,
Aralia Chinensis, var. Mandshurica,
Aralia spinosa,
Arundinaria falcata,
Chamærops humilis,
Dicksonia antarctica,
Eriobotrya Japonica,
Erythea armata,
Fatsia Japonica,
Fatsia papyrifera,
Musa Ensete,
Prunus Laurocerasus,
Ricinus Cambodgensis,
Ricinus macrophyllus,
Ricinus sanguineus,
Ricinus Zanzibarensis,

AA. *Larger Trees.*

Catalpa bignonioides,
Catalpa ovata,
Catalpa speciosa,
Cordyline australis,
Cordyline Banksii,
Cordyline indivisa,
Cordyline stricta,
Corynocarpus læviga,
Erythea edulis,
Eucalyptus calophylla,
Eucalyptus ficifolia,
Ficus Carica,
Ficus macrophylla,
Gymnocladus Canadensis.
Jubæa spectabilis,
Livistona australis,
Magnolia grandiflora,
Paulownia imperialis,
Phœnix Canariensis,
Phœnix dactylifera,
Phœnix reclinata,
Phœnix sylvestris,
Phytolacca dioica,
Trachycarpus excelsus,
Tristania conferta,
Washingtonia filifera,
Washingtonia robusta.

Eucalyptus Globulus can also be used effectively if cut down periodically when the falcate leaves begin to appear; it will continue to shoot up vigorously from the same root for several years. *Eucalyptus robusta* is useful for screen purposes if cut out before it becomes straggling.

2. *Trees with Ornamental Flowers.*—In making the following grouping, arranged according to relative hardiness, it has been impossible to give precise information as to the exact degree of frost-tolerance of the several species, as we can find but meager published data on the subject.

A. *Susceptible to light frost.*

The following would probably succumb to a temperature of 28° Fahr.:

Eucalyptus calophylla,
Eucalyptus ficifolia,
Jacaranda ovalifolia.

AA. *Susceptible to heavy frost.*

The following are not likely to stand a temperature of 20° Fahr. Some of them may succumb at 25° Fahr., particularly while young:

Acacia Baileyana,
Acacia cyanophylla,
Acacia elata,
Acacia falcata,
Acacia longifolia,
Acacia mollissima,
Acacia neriifolia,
Acacia pendula,
Acacia salicina, etc.
Bursaria spinosa,
Eucalyptus cornuta,
Eucalyptus corymbosa,
Eucalyptus polyanthema,
Eucalyptus sideroxylon, var. pallens,
Hymenosporum flavum,
Pittosporum undulatum.

AAA. *Hardy.*

Acacia pycnantha,
Æsculus carnea,
Æsculus Hippocastanum,
Albizzia Julibrissin,
Catalpa bignonioides,
Catalpa ovata,
Catalpa speciosa,
Cercis Canadensis,
Cercis Siliquastrum,
Cratægus mollis,
Cratægus monogyna (vars. Pauli, punicea, alba plena, etc.),
Kœlreuteria paniculata,
Laburnum vulgare,
Liriodendron Tulipifera,
Magnolia acuminata,
Magnolia grandiflora,
Magnolia Kobus,
Magnolia Soulangeana,
Magnolia stellata,
Paulownia imperialis,
Prunus Armeniaca (double-fld.),
Prunus cerasifera, var. atropurpurea,
Prunus Japonica,
Prunus Persica (white-fld., double red-fld., dark-fld., etc.),
Prunus spinosa (double-fld.),
Pyrus Halliana,
Pyrus Ioensis (Bechtel's double crab),
Robinia hispida,
Robinia Pseudacacia,
Sophora Japonica,
Sorbus Aucuparia.

3. *Trees with Colored Foliage.*

A. *Glaucous.*

B. *Susceptible to frost (20° Fahr. and perhaps less).*

Acacia Baileyana,
Acacia dealbata,
Acacia glaucescens,
Acacia salicina,
Erythea armata,
Eucalyptus Globulus (pollarded to produce suckers),
Eucalyptus polyanthema,
Eucalyptus Risdoni,
Eucalyptus sideroxylon, var. pallens,
Leucadendron argenteum,
Phœnix dactylifera,
Washingtonia Sonoræ.

BB. *Hardy.*

Cedrus Atlantica, var. glauca,
Cedrus Deodara, var. glauca,
Picea pungens, var. cœrulea,
Picea pungens, var. glauca,
Sequoia sempervirens, var. glauca.

AA. *Purple or bronze.*

B. *Susceptible to 25° Fahr.*

Ricinus Cambodgensis,
Ricinus communis, var. Gibsonii.

BB. *Hardy.*

Acer platanoides, var. Reitenbachi,
Acer platanoides, var. Schwedleri,
Betula alba, var. atropurpurea,
Fagus sylvatica, var. purpurea,
Fagus sylvatica, var. purpurea Riversi,
Prunus cerasifera, var. atropurpurea,
Prunus Persica var.

4. *Wide-spreading Trees for Shade, Mostly with Rounded Outline.*—It frequently happens that the owner of a garden desires a wide-spreading tree in the back or one corner of his domain, under which to swing a hammock on a hot day; such trees are also useful in the school yard, affording welcome shade in which the children can eat their lunch.

A. *Deciduous, all hardy.*

B. *Growth rapid or medium.*

C. *Suckers likely to be troublesome.*

Populus alba,
Robinia Pseudacacia,
Ulmus Americana,
Ulmus racemosa.

CC. *Suckers not troublesome.*

D. *Requiring a great deal of water.*

Salix Babylonica.

DD. *Requiring not much water.*

Acer macrophyllum,
Acer Negundo,
Acer Negundo, var. Californicum,
Acer platanoides,
Acer platanoides, var. Reitenbachi,
Acer platanoides, var. Schwedleri,
Acer Pseudo-platanus,
Acer saccharinum,
Acer saccharinum, var. Wieri,
Carya olivæformis,
Fraxinus Americana,
Fraxinus velutina,
Quercus lobata,
Quercus pedunculata,
Ulmus campestris.

BB. *Growth somewhat slow.*

Acer campestre,
Æsculus carnea,
Æsculus Hippocastanum,
Carpinus Betulus,
Castanea sativa,
Fagus sylvatica, var. purpurea,
Juglans Sieboldiana,
Liriodendron Tulipifera,
Melia Azedarach, var. umbraculiformis,
Platanus orientalis,
Quercus coccinea,
Quercus Kelloggii,
Quercus lobata,
Quercus macrocarpa,
Quercus rubra,
Sophora Japonica,
Tilia Americana,
Tilia Europæa,
Ulmus campestris.

AA. *Evergreen.*

B. *Growth rapid: trees susceptible to 25° Fahr*

Acacia mollissima.

BB. *Growth somewhat slow: trees hardy.*

Arbutus Menziesii,
Ficus Carica,
Olea Europæa,
Pinus Pinea,
Quercus agrifolia,
Schinus Molle,

5. *Ornamental Trees affording but Little Shade.*

A. *Outline oblong or nearly columnar.*

B. *Deciduous.*

Populus nigra, var. Italica.

BB. *Evergreen.*

Cupressus sempervirens,
Cupressus sempervirens, var. fastigiata.
Juniperus communis, var. Hibernica,
Taxus baccata, var. fastigiata.

AA. *Outline conical or spiral, usually pointed.*

B. *Coniferæ, with mostly narrow leaves.*

C. *Deciduous: hardy.*

Larix decidua,
Larix leptolepis.
Taxodium distichum.

CC. *Evergreen.*

D. *Susceptible to severe frost (probably about 20° Fahr.).*

Agathis robusta,
Araucaria Bidwillii,
Araucaria Braziliana,
Araucaria Cookii,
Araucaria Cunninghamii,
Araucaria excelsa,
Araucaria imbricata,
Pinus Canariensis.

DD. *Hardy.*

Abies balsamea,
Abies Cephalonica,
Abies concolor,
Abies nobilis,
Abies Nordmanniana,
Abies Pinsapo,
Cedrus Atlantica,
Cedrus Deodara,
Cedrus Libani,
Cephalotaxus drupacea,
Cephalotaxus Fortunei,
Chamæcyparis Lawsoniana,
Cryptomeria Japonica,
Cryptomeria Japonica, var. elegans,
Cunninghamia Sinensis,
Cupressus Goveniana,
Cupressus macrocarpa,
Cupressus macrocarpa, var. Guadalupensis,
Libocedrus Chilensis,
Libocedrus decurrens,
Picea Ajanensis,
Picea alba,
Picea Engelmanni,
Picea excelsa,
Picea nigra, var. Doumetti,
Picea polita,
Picea pungens,
Pinus Laricio, var. Austriaca,
Pinus contorta,
Pinus Coulteri,
Pinus densiflora,
Pinus monophylla,
Pinus Pinaster,
Pinus radiata,
Pinus Sabiniana,
Pinus sylvestris,
Podocarpus Totara,
Pseudotsuga Douglasii,
Sciadopitys verticillata,
Sequoia gigantea,
Sequoia sempervirens,
Taxus baccata,
Thuja gigantea,
Thuja orientalis,
Thujopsis dolabrata,
Torreya Californica,
Torreya nucifera.

BB. *Foliage broad.*

C. *Deciduous; hardy.*

Betula alba,
Betula lenta,
Betula lutea,
Betula papyrifera,
Betula populifolia,
Ginkgo biloba,
Quercus Cerris
Quercus nigra,
Sorbus Aucuparia.

CC. *Evergreen.*

D. *Susceptible to severe frost (probably 20° Fahr. and even less).*

Cinnamomum Camphora,
Corynocarpus lævigatas,
Cryptocarya Miersii,
Grevillea robusta,
Sterculia diversifolia,
Tristania conferta.

DD. *Hardy.*

Acacia melanoxylon,
Cerasus Lusitanica,
Ilex Aquifolium,
Lagunaria Patersonii,
Laurus nobilis,
Pittosporum crassifolium,
Quercus Suber,
Umbellularia Californica.

AAA. *Outline more or less rounded, but trees not as wide-spreading nor as shade-giving as in class 4.*

B. *Deciduous.*

C. *Susceptible to frost (25° Fahr.).*

Phytolacca dioica.

CC. *Hardy.*

Æsculus glabra,
Fraxinus Americana,
Fraxinus excelsior,
Fraxinus Ornus,
Gymnocladus Canadensis,
Juglans Californica,
Juglans nigra,
Kœlreuteria paniculata,
Paulownia imperialis,
Robinia Pseudacacia.

BB. *Evergreen.*

C. *Probably susceptible to severe frost (20° Fahr. or less).*

Acacia cyanophylla,
Alectryon excelsum,
Bursaria spinosa,
Eucalyptus calophylla,
Eucalyptus cornuta,
Eucalyptus corymbosa,
Eucalyptus corynocalyx,
Eucalyptus ficifolia,
Eucalyptus Globulus,
Eucalyptus maculata, var. citriodora,
Eucalyptus robusta,
Hymenosporum flavum,
Maytenus Boaria.

CC. *Hardy.*

Acacia pycnantha,
Eucalyptus amygdalina,
Eucalyptus Gunnii,
Eucalyptus leucoxylon,
Eucalyptus obliqua,
Eucalyptus rostrata,
Eucalyptus rudis,
Eucalyptus viminalis,
Jubæa spectabilis,
Phœnix Canariensis,
Phœnix reclinata,
Phœnix sylvestris,
Pittosporum eugenioides,
Pittosporum tenuifolium,
Pittosporum undulatum.

AAAA. *Drooping trees.*

B. *Deciduous.*

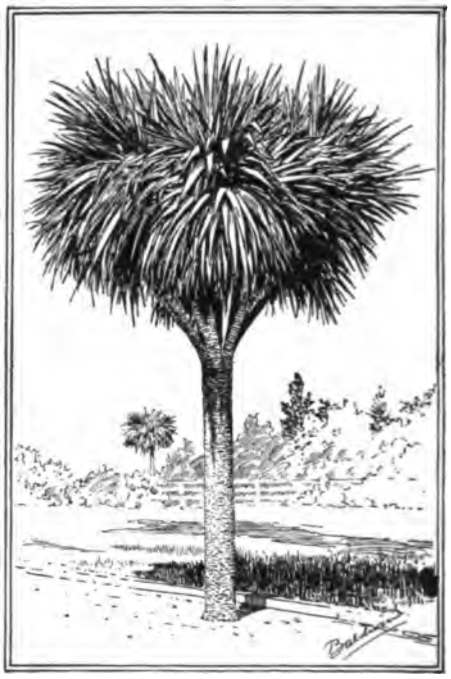
Acer saccharinum, var. Wieri laciniatum,
Betula alba, var. pendula elegans,
Betula alba, var. pendula laciniata,
Betula alba, var. pendula Youngi,
Cratægus monogyna, var. pendula,
Fagus sylvatica, var. pendula,
Fraxinus excelsior, var. aurea pendula,
Fraxinus excelsior, var. pendula,
Juglans regia, var. pendula,
Laburnum vulgare, var. pendulum,
Morus alba (Teas' Weeping),
Populus grandidentata, var. pendula,
Prunus fruticosa, var. pendula,
Quercus lobata,
Salix Babylonica,
Salix Babylonica, var. Lickii,
Sophora Japonica pendula,
Sorbus Aucuparia, var. pendula,
Tilia Americana, var. pendula,
Tilia Europæa, var. pendula,
Ulmus Americana, var. pendula,
Ulmus campestris, var. pendula,
Ulmus glabra, var. pendula,
Ulmus montana, var. pendula.

BB. *Evergreen.*

Cupressus funebris,
Schinus Molle.

2562. Weeping elm, type of a grotesque horticultural variety, Ulmus scabra var. horizontalis.

6. *Trees for Streets, Avenues and Roadsides.* — The number of tree species suitable for street planting is limited by the necessarily heavy restrictions, as to height, spread, sewer-penetration and sidewalk-raising, imposed by municipal street departments. In European cities the first-named objections are overcome by means of frequent and systematic pruning to a uniform standard; where this necessity can be obviated by the selection of trees which naturally keep within the desired bounds, the labor of maintaining them in a sightly condition is minimized and the result much more pleasing.



2563. Cordyline australis.
Often called Dracæna Palm. California.

For town streets not more than 60 feet in width, it is important to have trees that will not give too much shade and prevent the rapid drying of the roadway after showers, nor be so tall nor wide-spreading as to obstruct the view and shut out sunshine, rendering the adjacent houses dark, cold and damp. On this account trees with narrow or pyramidal outline are in many cases preferable to those with wide-spreading habit, and, generally speaking, deciduous trees are more suitable than evergreen, although at the time of losing their leaves they make more litter. Exception may be made in favor of such evergreen species as certain palms and cordylines, some acacias and a few other species mentioned below.

It is not wise to use trees of very rapid growth on town streets; they soon become too large and require frequent trimming, which is usually equivalent to mutilation, and are likely to interfere with sewers.

It cannot be said that street planting in California towns has, in most cases, been satisfactory. In spite of the much larger variety of suitable material than is available in most of the states, there are few examples of good street-planting to be met with. In most of our towns the eye is greeted with a few straggling trees, of which perhaps not more than two are of one kind, recalling Professor Waugh's apt simile of "nine monstrously different buttons in a row down the front of a Prince Albert coat." There are many pleasing exceptions, however, although few are entirely satisfactory. The repeated attempts to improve the appearance of a town by planting trees along the streets should be encouraged on every occasion, and the object of this article is to render

2564. Abies venusta, one of the California firs.

assistance by pointing out how some of the mistakes may be avoided. The unsatisfactory results of street-planting, so often met with, can generally be traced to one or all of three causes:

1. Selection of unsuitable species.
2. The mixing of several species on the same block and even in front of the same lot.
3. Crowding the trees.

This last-mentioned source of trouble is perhaps the cause of more failure than the first. When trees are once growing, few persons have the heart to thin out the specimens to the proper distance apart; finally a newcomer, without personal feeling in the matter and noting only that there is too much shade and too little light, cuts down the whole row and a gap is left in what may have been a fairly uniform block. Spreading avenue trees of large size should not stand closer than 50 ft. apart; smaller trees, on narrower streets should have 40 or at the very least 30 ft., unless they are slender species such as cordylines or washingtonias, when

20 ft. may be sufficient. As a rule, three small trees to a 50-foot lot will be found ample, and the center one of these three should be taken out when they begin to meet at the sides; if the whole street is planted uniformly with the same species, and at this same distance, the result will be much more pleasing than if four or five trees are planted in front of every house.

A. *For city and town streets.*

B. *Small trees suitable for streets 60 ft. wide or less.*

C. *Deciduous.*

D. *Growth rapid or moderate.*

Betula alba,
Betula lutea,
Betula papyrifera,
Betula populifolia,
Catalpa bignonioides,
Catalpa ovata,
Catalpa speciosa,
Kœlreuteria paniculata,
Melia Azedarach, var. umbraculiformis,
Paulownia imperialis,
Rhus typhina,
Sorbus Aucuparia.

DD. *Growth slow.*

Cratægus mollis,
Cratægus monogyna,
Ginkgo biloba.

CC. *Evergreen.*

D. *Growth rapid or moderate.*

E. *Palms and arborescent Liliaceæ.*

Cordyline australis (Fig. 2563),
Cordyline Banksii,
Cordyline indivisa,
Cordyline stricta,
Erythea edulis,
Livistona australis,
Trachycarpus excelsus,
Washingtonia filifera,
Washingtonia robusta.

EE. *Evergreen trees other than palms and arborescent Liliaceæ.*

Acacia Baileyana,
Acacia cyanophylla,
Acacia falcata,
Acacia lineata,
Acacia longifolia,
Acacia neriifolia,
Myoporum lætum,
Pittosporum eugenioides,
Pittosporum tenuifolium,
Sterculia diversifolia.

DD. *Growth slow.*

Alectryon excelsum,
Bursaria spinosa,
Cinnamomum Camphora,
Eucalyptus ficifolia,
Ilex Aquifolium,
Lagunaria Patersonii,
Ligustrum lucidum,
Magnolia grandiflora,
Maytenus Boaria,
Olea Europæa,
Pittosporum crassifolium,
Tristania conferta.

BB. *Larger trees for streets, avenues and boulevards 80 to 100 ft. wide.*

C. *Deciduous.*

D. *Growth rapid or moderate.*

Acer saccharinum,
Fraxinus Americana,
Fraxinus velutina,
Gymnocladus Canadensis,
Hicoria Pecan,
Platanus orientalis,
Quercus pedunculata,
Robinia Pseudacacia,
Ulmus campestris.

DD. *Growth slow.*

Gleditschia triacanthos,
Liriodendron Tulipifera,
Sophora Japonica,
Tilia Americana,
Tilia Europæa.

CC. *Evergreen.*

D. *Palms and bananas.*

Erythea edulis,
Livistona australis,
Musa Ensete,
Trachycarpus excelsus,
Washingtonia filifera,
Washingtonia robusta.

DD. *Evergreen trees other than palms and bananas.*

Acacia elata,
Acacia melanoxylon,
Acacia pycnantha,
Angophora intermedia,
Angophora subvelutina,
Eucalyptus amygdalina, var. angustifolia,
Eucalyptus calophylla,
Eucalyptus corymbosa,
Eucalyptus ficifolia,
Eucalyptus polyanthema,
Eucalyptus rudis,
Eucalyptus sideroxylon, var. pallens,
Ficus macrophylla,
Syncarpia laurifolia,
Tristania conferta.
Umbellularia Californica,

BBB. *For avenues and boulevards without sidewalks or with wide spaces between sidewalk and driveway.*

For this purpose almost any of the larger and more ornamental species enumerated in the other lists may be selected. Spreading coniferous trees, with broad bases (such as *Sequoia gigantea*, etc.) can often be used to advantage, as well as the wide-spreading feather-palms (Phœnix and Jubæa).

AA. *For country roads.*

B. *Deciduous.*

Acer campestre,
Acer macrophyllum,
Acer Negundo,
Acer Negundo, var. Californicum,
Acer platanoides,
Acer saccharinum,
Æsculus carnea,
Æsculus Hippocastanum,
Ginkgo biloba,
Hicoria Pecan,
Juglans Californica,
Juglans nigra,
Juglans Sieboldiana,
Liriodendron Tulipifera,
Paulownia imperialis,
Phytolacca dioica,
Populus nigra, var. Italica,
Quercus lobata,
Quercus pedunculata,
Robinia Pseudacacia,
Sophora Japonica,
Taxodium distichum,
Tilia Americana,
Tilia Europæa,
Ulmus Americana,
Ulmus campestris,
Ulmus racemosa.

BB. *Evergreen.*

Acacia melanoxylon,
Acacia mollissima,
Arbutus Menziesii,
Cinnamomum Camphora,
Cryptomeria Japonica,
Eucalyptus botryoides,
Eucalyptus calophylla,
Eucalyptus capitellata,
Eucalyptus cornuta,
Eucalyptus diversicolor,
Eucalyptus leucoxylon,
Eucalyptus rostrata (Fig. 2566),
Eucalyptus rudis,
Eucalyptus viminalis,
Ficus macrophylla,
Olea Europæa,
Pinus radiata,
Quercus Suber,
Schinus Molle,
Sequoia gigantea,
Sequoia sempervirens,
Sterculia diversifolia,
Tristania conferta.
Umbellularia Californica,

7. *Trees which have been tried but have proved unsatisfactory.*—There are many species which have failed to give satisfaction in some localities because of local peculiarities of climate or soil; there are some, also, which have proven unsatisfactory on account of habit, etc.; from among these may be mentioned:

Eucalyptus robusta, a species which is exceedingly handsome as a young tree and has been extensively planted along roadsides and streets in the warmer parts of the state; when mature it becomes straggling and exceedingly brittle, breaking up in an unsightly manner.

2565. Phœnix Canariensis, one of the best palms for outdoor planting. Berkeley, California.

Eucalyptus corynocalyx also becomes straggling and unsightly with age.

Schinus Molle should be avoided in the Citrous belt, as it is found to harbor and become a nursery for scale insects. As a street tree it is also unsatisfactory, becoming too large and straggling and requires too much pruning to keep it within bounds; its large surface roots often break cement and asphalt sidewalks.

Melia Azedarach, var. *umbraculiformis*, is found unsatisfactory in the immediate vicinity of the coast; as a sidewalk tree it is exceedingly untidy when losing its leaves, and is also much subject to scale insects.

Acacia melanoxylon is generally debarred from the Citrous belt, as a breeder of scale; when mature it is said to suffer quickly from the effects of drought. In the moister climate of the immediate vicinity of the coast, near San Francisco, however, it proves entirely satisfactory.

Populus alba, *Robinia Pseudacacia* and *Ulmus racemosa* are exceedingly troublesome when used as sidewalk trees on narrow streets; their surface roots often break the cement or asphalt sidewalks, and the suckers come up in the midst of lawns several yards away from the parent tree.

Ficus macrophylla is another tree injurious to sidewalks.

Eucalyptus Globulus, and in fact almost all species of the genus, are frequently debarred by town ordinance from growth within 60 or even 70 feet of a sewer, on account of the remarkable length and penetrating power of their roots.

Paulownia imperialis is sometimes objected to on account of the somewhat untidy appearance of the persistent seed-pods, which require no little labor if all are to be removed after flowering.

Grevillea robusta has brittle wood and is usually much broken in heavy winds, but can be used with satisfaction if kept well cut back.

The species of Phœnix and Jubæa should be avoided on account of their low, wide-spreading habit, except for avenues and boulevards where there is no sidewalk or where there is from 20 to 30 feet space between sidewalk and driveway.

Ailanthus glandulosa has a bad reputation on account of its disagreeable odor, but as this is only found in the staminate trees, it can be avoided by planting the pistillate (fruit-bearing) trees only.

2566. One of the gum trees—Eucalyptus rostrata. Eleven years planted; 86 feet high. California.

8. *Trees for Alkali Soils.*—There are many places in those parts of the state that enjoy a high temperature and low rainfall, where the percentage of alkali salts in the soil is too great for the cultivation of most of our ornamental trees, and where it is very important that some shade-producing species be grown.

A. *Tolerant of strong "black" alkali (Sodium carbonate).*

The most alkali-tolerant tree of those yet tested is *Kœlreuteria paniculata*, a small species 15 to 30 feet high, with feathery, pinnate leaves and ornamental yellow blossoms.

AA. *Tolerant of medium alkali (chiefly "white" salts).*

Acacia melanoxylon,
Ailantus glandulosa,
Albizzia lophantha,
Casuarina equisetifolia,
Eucalyptus amygdalina, var. angustifolia (apparently the least sensitive of the Eucalypts),
Eucalyptus rostrata (Fig. 2566),
Eucalyptus sideroxylon, var. rosea,
Phœnix dactylifera,
Platanus orientalis,
Populus Fremonti,
Quercus lobata,
Robinia Pseudacacia.

AAA. *Only fairly tolerant.*

Acer macrophyllum.
Acer Negundo, var. Californicum,
Cinnamomum Camphora,
Gleditschia triacanthos,
Ulmus spp.
Washingtonia filifera.

AAAA. *Tested and found unsuitable.*

Most of those trees of the humid regions, e. g., the eastern states and N. Europe, which have been tried on alkali soils, have been found to suffer and to remain dwarf and stunted. This is particularly true of *Liriodendron Tulipifera*, *Quercus pedunculata* and species of Tilia.

Since writing the above, the following additional information on the alkali tolerance of ornamental trees has been brought to light through the investigations of Dr. R. H. Loughridge of the Agricultural Experiment Station at Berkeley, and has courteously been placed at my disposal.

Total amount of salts actually found in the upper four feet of soil in which the following trees were growing, expressed in tons per acre:

	Tons per acre in depth of 4 feet.
Kœlreuteria paniculata	32
Platanus orientalis	21⅛
Eucalyptus amygdalina	20
Eucalyptus angustifolia	20
Washingtonia (species not stated)	7⅛
Phœnix dactylifera	5
Cinnamomum Camphora	3⅛

JOS. BURTT DAVY.

IV. TREES FOR SOUTHERN CALIFORNIA.—*Street Trees:* *Sterculia diversifolia*, Australian Bottle Tree; *Acacia Melanoxylon*, Blackwood Acacia; *Cinnamomum Camphora*, Camphor Tree; *Sterculia acerifolia*, Australian Flame Tree; *Eucalyptus robusta*, Swamp Mahogany Gum; *Grevillea robusta*, Silk Oak; *Acacia dealbata*, Black Wattle; *Jacaranda ovalifolia; Ligustrum Japonicum*, Japan Privet; *Pinus radiata*, Monterey Pine.

The above are the best ten trees for street purposes, but among these might be placed *Cordyline australis* and *C. indivisa*, and several kinds of palms. One deciduous tree is much used—*Melia Azederach*, var. *umbraculiformis*, the Umbrella Tree. Though less known or used, *Eucalyptus calophylla* is by far a better street or sidewalk tree than *E. robusta*. Very few conifers other than those noted do well in this climate. Any extension of the above list must be made almost entirely through palms, eucalypti and acacias, among which there is plenty of room for personal preference.

Lawn and Shade Trees: Araucaria excelsa, Norfolk Island Pine; *Araucaria Bidwillii*, The Bunya-Bunya; *Jacaranda ovalifolia; Cinnamomum Camphora*, Camphor Tree; *Ficus macrophylla*, Rubber Tree; *Ficus elastica* (where hardy), Rubber Tree; *Sterculia acerifolia*, Australian Flame Tree; *Magnolia fœtida*, Bull Bay; *Sequoia gigantea*, California Big Tree; *Cedrus Deodara*, Deodar.

The above list contains ten of the best ornamental trees. It might be extended indefinitely if all our good trees were included. The ornamental eucalypti and acacias would at least treble this list, and the palms alone would easily double it. ERNEST BRAUNTON.

TREE TOMATO. See *Cyphomandra*.

TREFOIL. See *Clover, Trifolium*.

TREVÈSIA (after the family Treves di Bonfigli of Padua, patrons of botany). *Aralidceæ*. About 9 species of small trees or shrubs from tropical Asia and the islands in that region, with large lvs. either palmately cut and simple or digitately or pinnate compound, and flowers which are rather large for the family and borne in panicled umbels: petals 8–12, valvate, somewhat thick; stamens 8–12: ovary 8–12-loculed: fruit large, ovoid. Greenhouse subject.

palmàta, Vis. (*Gastònia palmàta*, Roxb.). A small tree, with the ends of the branches sparingly prickly and the young parts tomentose: lvs. crowded at the ends of the branches, 1–1½ ft. across, palmately 5–9-lobed to below the middle; petioles 1–1½ ft. long: panicles long-peduncled: umbels 6 in. through, long-peduncled: fls. 1 in. across, greenish white. Himalayas. B.M. 7008. F. W. BARCLAY.

TRIÀNEA Bogoténsis, Karst., is *Limnobium Bogotensis*, Benth. & Hook. See Vol. II, page 925. Also G.C. II. 15:467.

TRIARTEA. Error in a nursery catalogue. See *Iriartea*.

TRICALÝSIA (Greek, *triple calyx;* true of some species). *Rubidceæ*. Here belong the two shrubs from Natal which are cult. in S. Fla. under the name of Kraussia. When Kraussia was written for this Cyclopedia the undersigned treated it in the manner suggested by Bentham and Hooker, Index Kewensis and Flora Capensis. Since then the writer has had access to the Flora of Tropical Africa, which throws a new light on the relationship of these plants. In Vol. 3 of that work Kraussia is made a section of Tricalysia characterized by having the calyx-limb 4–6-lobed; the other species have a truncate calyx-limb which is entire or nearly so. Tricalysia is a genus of erect or climbing shrubs, with small axillary flowers. It contains a few species from Natal and Madagascar in addition to 21 from tropical Africa. The two species mentioned below have funnel-shaped fls. which are about a quarter of an inch long. Their color is not stated; it is probably white. The fls. are borne in clusters, which are much shorter than the leaves. It is not clear why these plants should be cultivated at all. They bloom in S. Calif., but have not bloomed in S. Fla.

Generic characters of Tricalysia: calyx-tube in many species girt at the base with a single or double epicalyx of involucral bracts: corolla funnel-shaped or shortly salver-shaped; throat bearded or glabrous; lobes 4–8; stamens 4–8, inserted at the mouth of the corolla; ovary 2-loculed, rarely 3-loculed. *Kraussia lanceolata* is here removed to Tricalysia and Hiern is cited as the author of the combination *Tricalysia lanceolata*, though the combination has probably never been formally made previous to this occasion.

A. *Lvs. lanceolate, acuminate.*

lanceolàta, Hiern (*Kraùssia lanceolàta*, Sond.). Shrub: lvs. lanceolate, acuminate: cymes many-fld.: calyx 5-toothed: throat of corolla densely bearded: stigma deeply 2-lobed, lobes revolute: fr. globose, the size of a pea. Natal.

AA. *Lvs. elliptic, obtuse.*

Sonderiàna, Hiern (*Kraùssia coriàcea*, Sond.). Shrub: lvs. elliptical, obtuse or minutely apiculate, wedge-shaped at the base, coriaceous, 1½–3½ in. long: cymes about 4-fld.; fls. pentamerous; pedicels ⅛–⅜ in. long; throat densely bearded; stigmas deeply 2-lobed, lobes revolute. Natal. W. M.

TRÍCHARIS. A section of *Dipcadi*.

TRICHÍNIUM (Greek, *hairy;* alluding either to the plant in general or to the fl.-heads). *Amarantàceæ*. A genus of 47 species of Australian herbs or shrubs, often hairy, with alternate narrow or rarely obovate leaves and pink or straw-colored flowers in terminal simple spikes or heads, with shining scarious bracts. Perianth-tube short; segments 5, equal, linear, rigid, usually flumose; stamens 5, but usually 1–3 of them small and antherless: fr. an indehiscent utricle.

exaltàtum, Benth. (*Ptilòtus exaltàtus*, Nees). A tender perennial, 2–3 ft. high, erect, usually branching above: lower lvs. 2–5 in. long, oblong-lanceolate rather thick, contracted into a long petiole; upper lvs. smaller: spikes erect, long-peduncled, at first ovoid-conical, becoming longer: perianth ¾ in. or less long, yellowish, with dull red tips. B.R. 25:28 (as *T. alopecuroides*).—Lately introduced in this country as a greenhouse subject.

T. Mánglesii, Lindl., is perhaps the choicest species. It has violet-purple fls. in large pyramidal heads 3 in. long and 2 in. wide at base. It could probably be grown as a summer annual. B.M. 5448. F.S. 23:2396. R.H. 1866:291. F. 1864:217. I.H. 13:464. G.C. 1864:555. F. W. BARCLAY.

TRICHLÒRIS (Greek for *three* and *green*). *Gramíneæ*. Under the name of *Chloròpsis*, or *Chloridópsis, Blanchardiàna*, seedsmen offer a tender perennial ornamental grass, growing 1–2½ ft. high and useful for edgings. Its proper name is **Trichlòris Blanchardiàna**, Hackel. It comes from Argentina. There are four other species of Trichloris, 2 from Chile and 2 from the southwestern U. S. There are no such recognized generic names as *Chloropsis* and *Chloridopsis*. Trichloris has the flowers arranged in long rather slender mostly erect spikes which are umbellate or panicled: spikelets 1–3-fld., the sterile bracts produced into prominent awns. *T. Blanchardiana* is a useful grass, its umbel-like clusters of soft-awned silvery spikes being very pleasing. It is readily grown from seeds. L. H. B.

TRICHOCÉNTRUM (Greek, *hair* and *slender;* alluding to the long, slender spur). *Orchidàceæ*. A small genus allied to Rodriguezia (Burlingtonia). The plants grow in dense matted tufts. Pseudobulbs very small, each bearing a broad, fleshy leaf. Inflorescence a few-fld. raceme on which usually only one flower opens at a time: sepals and petals free, spreading; labellum larger, spurred, with 2 lateral lobes and a 2-parted middle lobe; column short: pollinia 2, on a wedge-shaped stipe. Sixteen species. Epiphytes of dwarf stature, growing best on blocks; free-flowering; they suffer from too much water at the root; give them a warmhouse temperature. Prop. by division.

álbo-purpùreum, Reichb. f. Lvs. oblong-lanceolate, 3 in. long, tufted: fls. on short peduncles, 2 in. across; sepals and petals obovate-lanceolate, inside maroon-brown, with greenish tips, outside greenish; labellum subquadrate, white, with a large purple spot on each of the lateral lobes. Brazil. B.M. 5688. A.F. 6:609.

tigrinum, Lindl. and Reichb. f. Similar in habit to the preceding: lvs. oblong, obtuse, speckled with red: fls. pendulous, nearly 3 in. across; sepals and petals broadly linear, yellow, speckled with red; labellum cuneate-obovate, emarginate, white, rose toward the disk. May. Cent. Amer. B.M. 7380. I.H. 24:282.

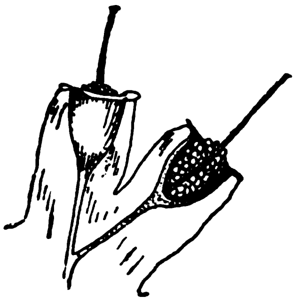
HEINRICH HASSELBRING.

TRICHOLÈNA (Greek, *trichos*, hair, *chlaina*, or in Latin, *læna*, a mantle; referring to the covering of silky hairs on the spikelets). *Gramíneæ*. A genus of 10 African species, one of which is cultivated for the ornamental inflorescence, which is used in making dry bouquets. Spikelets in loose panicles, very silky hairy, to which fact the cultivated species owes its ornamental appearance. Allied to Panicum, from which it differs in having the second empty glume (which, on account of the first glume being small or wanting, is apparently the first) provided at the base with a conical callus, and this and the third glume more or less awned between the cleft apex.

ròsea, Nees (*T. violàcea*, Hort. *Pánicum Teneriffæ*, R. Br.). First glume wanting; spikelets (second and third glumes) clothed with violet silky hairs; awns short or wanting; culm 2–3 ft. South Africa.

A. S. HITCHCOCK.

TRICHÓMANES (Greek, *soft hair*). *Hymenophyllàceæ*. A genus of filmy ferns distinguished by its tubular, cup-like indusium and filiform elongate receptacle. Fig. 2567. Very delicate in texture and capable of being grown successfully only under shaded glass. Over 100 species are known. Various species may be found in the collections of fanciers, but the following appear to be the only ones regularly in the American trade. For culture, see *Ferns*.



2567. Fructification of Trichomanes.

radicans, Swz. Lvs. 2–8 in. long, 1–1½ in. wide, bipinnatifid; pinnæ ovate, obtuse; indusia terminal, on short lobes. Tropical regions, extending into our southern states as far as Kentucky.

Prieùrii, Kunze (*T. ánceps*, Hook.). Lvs. 12–18 in. long, 6–12 in. wide, tri-quadripinnatifid; pinnæ ovate-lanceolate; sori 2–12 to a pinnule, small, axillary; indusium with a much dilated lip. Tropical America.

L. M. UNDERWOOD.

TRICHONÈMA. See *Romulea*.

TRICHOPÍLIA (Greek, *hair* and *cap;* the anther is concealed under a cap surmounted by three tufts of hair). *Orchidàceæ*. About 20 species, ranging from Mexico to South America. Pseudobulbs crowded on the short rhizome, flattened, and often elongate, 1-lvd., surrounded with dry scales at the base: lvs. large, solitary, erect, fleshy, keeled: fls. abundantly produced on short, nodding or decumbent scapes; sepals and petals narrow, spreading, often twisted; labellum large, forming the most conspicuous part of the flower, united with the column below, lateral lobes convolute, middle lobe spreading; anther bent over; pollinia on a triangular caudicle; clinandrum fimbriately winged. The flowers keep fresh a long time, both on the plant and when cut. Handsome orchids, usually grown in pots, although epiphytal. They need an intermediate or greenhouse temperature. If grown too warm, they suffer. Prop. by division.

Galeottiàna, A. Rich. & Gal. Pseudobulbs narrow, flattened, 5 in. long: lvs. oblong, acute, about 6 in. long: scapes short, mostly 1-fld.: sepals and petals cuneate-lanceolate, yellowish green, sometimes with a band of cinnamon down the middle; labellum trumpet-shaped, whitish with some purple streaks and dots in the center, and yellow in the throat. Aug., Sept. Costa Rica, Mexico. I.H. 6:225 (as *T. picta*). B.M. 5550 (as *T. Turialvæ*).

fràgrans, Reichb. f. (*Pilúmna fràgrans*, Lindl.). Pseudobulbs clustered, flattened, 3–5 in. long, 1-lvd.: lvs. oblong-lanceolate, acute, 6–8 in. long: scape pendent, 1 ft. long, about 6-fld.: fls. on pedicels 3 in. long; sepals and petals spreading, linear-lanceolate, 2½–3 in. long, wavy and twisted, greenish white; labellum folded over the column, spreading in front, and somewhat lobed, white with a yellow stain in the throat. Summer. Colombia. B.M. 5035.—Fls. almond-scented.

nóbilis, Reichb. f. (*Pilúmna nóbilis*, Reichb. f. *T. cándida*, Linden). Pseudobulbs large: lvs. broadly oblong-acute: fls. white; sepals and petals linear-oblong, acute, 2 in. long, scarcely twisted; labellum large, white with a yellow spot in the throat. Venezuela. I.H. 19:94 (as *T. fragrans*, var. *nobilis*). F.M. 1872:21 (as *T. fragrans*).—This has larger, stouter pseudobulbs and shorter broader lvs. than *T. fragrans*. The labellum is larger and the petals shorter compared with the size of the flower.

tórtilis, Lindl. Pseudobulbs oblong, compressed, somewhat curved, 2–4 in. long: lvs. solitary, oblong, acute, 6 in. long: fls. solitary, on decumbent stalks shorter than the lvs.; sepals and petals linear-lanceolate, 2 in. long, spirally twisted, brown with yellowish margins; labellum forming a tube around the column, upper portion expanded, 4-lobed, white with crimson spots, becoming entirely crimson within. Fls. profusely in summer and sometimes again in winter. Mexico. B.M. 3739. B.R. 22:1863. F.C. 3:101. B. 3:122. —Var. *álba* is advertised.

suàvis, Lindl. Fig. 2568. Pseudobulbs thin, compressed, 2 in. long: lvs. broadly oblong, 8 in. long: scape pendent, about 3-fld.: fls. on long, curved stalks, large; sepals and petals lanceolate-acuminate, wavy, nearly straight, 2 in. long, white or cream-colored; labellum large, projecting forward, white or cream-colored, spotted with pale purple, yellow in the throat; limb large-lobed, wavy and crenate. May, June. Cent. America. B.M. 4654. F.S. 8:761. R.H. 1859, pp. 220, 221; 1887, p. 454. Gn. 4, p. 511; 31, p. 452; 38, p. 185; 48, p. 79; 51, p. 371. R.B. 23:256. G.M. 38:281.—Var. **álba**, Warner. Fls. white with a yellow spot in the throat of the labellum.

marginàta, Henfr. (*T. coccinea*, Warsc. *T. crispa;* var. *marginàta*, Hort.). Pseudobulbs clustered, oblong, compressed: lvs. broadly lanceolate, suddenly acuminate, subauriculate at the base: scape about 3-fld.: fls. large, whitish outside, reddish purple within; sepals and petals linear-lanceolate, margined with white, the former slightly twisted; labellum trumpet-shaped, with a large, rounded, wavy, 4-lobed blade. May, June. Cent. America. B.M. 4857. F.S. 14:1490; 18:1925. G.C. III. 20:456. F.M. 1874:98 (as *T. lepida*).

2568. Trichopilia suavis (× ¼).

crispa, Lindl. This plant was described by Lindley in Linden's catalogue. It is closely related to *T. marginata*, which is sometimes classed as a variety of *T. crispa*. The following description is taken from Watson's Orchids. Pseudobulbs ovate, flattened, 2–3 in. long, dark green, 1-lvd.: lvs. leathery, 6 x 2 in., keeled, acute-pointed: flower-spikes basal, drooping, short, 3-fld.: fls. with pedicels 2 in. long; sepals and petals spreading, 2½ in. long, ½ in. wide, wavy-edged, twisted, brownish yellow; lip folded over the column, spreading in front, 1½ in. across, colored deep crimson with a white margin. May, June. Costa Rica.

Heinrich Hasselbring.

TRICHOSÁNTHES (Greek, *hair* and *flower;* alluding to the fringed edge of the petals). *Cucurbitàceæ.* Snake Gourd. About 40 species of climbing herbs, annual or perennial by tuber-like roots, natives of southeastern Asia and Australia. They are tender plants with usually large, roundish, lobed leaves and white axillary flowers. The male fls. are usually in racemes, while the female are nearly always solitary. The fruit is often ornamental and highly colored. In *T. Anguina* it is exceedingly long, having been noted over 6 ft. in length. Calyx long, tubular, 5-toothed; petals 5, united at the base, ovate to lanceolate, longly fimbriate: stamens 3 (in the male flower). D. C. Mon. Phaner. 3:351. The plants flower in July from seed sown in March. They may be treated as tender annuals.

A. *Bracts small or none on the racemes of male fls.*

B. *Fruit ovoid.*

cucumeroides, Maxim. Root fleshy, tuberous: stem slender, 12–15 ft.: lvs. ovate in outline, 4–6 in. long, more or less palmately 3–5-lobed, margin crenulate: peduncle bearing the male fls. 1–4 in. long and 3–15-fld.: petals about ½ in. long, oblong, acute, longly fringed: fr. oblong, shortly rostrate, nearly 3 in. long, vermilion-colored. Japan. Offered by importers of Japanese plants.

BB. *Fruit oblong.*

Anguina, Linn. (*T. colubrina*, Jacq.). Serpent or Snake Gourd. Stem slender, tall-growing: lvs. nearly circular in outline, 5–7 in. across, 3–7 lobed; lobes round; margin undulate or wavy: peduncle bearing the male fls. 4–10 in. long, 8–15-fld.: body of petals oblong, less than ½ in. long, fringes ½ in. long: fr. slender, contorted, often exceeding 3 ft. in length. India. B.M. 722. B.R. 32:18 (as *T. colubrina*). R.H. 1859, p. 595.

AA. *Bracts large on the male raceme.*

B. *Calyx-segments entire.*

C. *Lvs. lobed.*

Kirilòwii, Maxim. (*Eopèpon vitifòlius*, Naud.). Perennial root tuber-like: stem annual, high climbing, 20–30 ft.: lvs. nearly circular in outline, 3–8 in. across, deeply 5–7-lobed, the lobes oblong, acute, coarsely serrate: racemes bearing the male fls. 4–8 in. long, 3–8-, rarely only 1-fld.: petals triangular-wedge-shaped, deeply cut and the segments much cut and longly fimbriate, ovoid, somewhat acute; base shortly attenuate, yellowish orange, about 4 in. long, 2½ thick. Mongolia.

CC. *Lvs. not lobed.*

cordàta, Roxb. (*T. palmàta*, Wall.). Root tuberous: stem robust, high climbing: lvs. wide, ovate-cordate, acute or shortly acuminate, 5–8 in. long, rarely somewhat angled or obscurely lobed; margin slightly dentate: peduncle bearing male fls. 5–8 in. long, 4–8-fld.: calyx-segments finely acute: fr. globose, red, orange-streaked, not acute at the apex. India.

BB. *Calyx-segments toothed.*

bracteàta, Voigt (*T. palmàta*, Roxb.). Stem stout, climbing to 30 ft.: lvs. broadly ovate in outline, scabrous above, usually deeply 3–7-lobed; lobes acute; margin dentate: peduncle bearing the male fls. 4–8 in. long, 5–10-fld.: fr. globose, red with orange stripes about 2 in. long. India.

F. W. Barclay.

TRICHÓSMA (Greek, *hair* and *ornament*). *Orchidàceæ.* Sepals and petals similar, erect-spreading, the lateral pair forming a distinct mentum with the projecting foot of the column; labellum 3-lobed, the lateral lobes erect, convolute over the column, middle lobe with longitudinal ridges: stems slender, 2-lvd.: inflorescence racemose. Resembles Cœlogyne.

suàvis, Lindl. Lvs. lanceolate, undulate, 3-nerved: fls. few in a terminal raceme, white, yellowish or purplish, fragrant; sepals ovate-lanceolate; petals oblong; labellum ovate-oblong, streaked with purple; disk yellow, middle lobe with several crenate ridges. Himalaya. B.R. 28:21.

T. albo-marginata of the trade is unidentified.

Heinrich Hasselbring.

TRICHOSTÈMA (Greek, *hair* and *stamen;* referring to the filaments). *Labiàtæ.* Blue Curls. A genus of 8 species of American plants, mostly low, aromatic, annual herbs with entire leaves and blue flowers. Calyx oblique and 2-lipped; corolla-tube shorter than the limb. Offered by some dealers in native plants. For fuller account, see Gray's Syn. Flora of North America.

A. *Calyx bell-shaped, regular, almost equally 5-cleft.*

lanàtum, Benth. A perennial shrubby plant with rosemary-like leaves and cymes of fls. in a naked terminal thyrse: lvs. narrow linear, 1-nerved, sessile, margins revolute: calyx and corolla covered with dense violet or purple wool; corolla ½ in. long. S. Calif. A very handsome shrub. Known as "Ramero."

AA. *Calyx oblique, 2-lipped.*

dichótomum, Linn. Bastard Pennyroyal. Low, viscid annual: lvs. oblong or lanceolate-oblong, obtuse, short-petioled: corolla blue or pink, sometimes white. Sandy fields, Mass. to Ky., Fla. and Texas.

F. W. Barclay.

TRICÝRTIS (Greek, *three convexities;* referring to the nectar-bearing sacs at the base of the three outer perianth-segments). *Liliàceæ.* "Toad-Lilies," as the Japanese call them, are autumn-blooming perennial herbs with 6-parted fls. which are generally an inch or more across, and of whitish color, spotted with purple. They are very distinct members of the lily family by reason of their season of bloom, quaintly spotted flowers, and the prominent nectar sacs mentioned above. They are not bulbous plants, but have a short rootstock emitting tufts of branched fibers. All the species are desirable, but if only one can be afforded the amateur should select *T. hirta*, var. *nigra*. *T. hirta* is perfectly hardy and has more fls. and larger ones than the other species, and with good management it blooms in September. Sometimes, however, it blooms so late that its flowers are prematurely destroyed by frost. For this reason some gardeners prefer to grow the plant in pots, which may be brought indoors when the fls. are at their best. The variety *nigra*, which differs in having darker colored spots, is said to bloom two or three weeks earlier than the type and can therefore be recommended to lovers of choice hardy plants, but with one reservation: it should not be placed in the ordinary mixed border where it will have to struggle against stronger-growing plants. It should be established in a bed where the plants need not be disturbed for years. Half a dozen plants in a circular bed could be made by division to spread into a solid mass in the course of a few seasons. Such a mass is much more desirable than one plant each of all the kinds. The bed should be made in a slightly shaded position. For soil, try a light fibrous loam mixed with leaf-mold and sand. An English expert, W. Goldring, has suggested as a companion to the Toad Lilies, either Lady Slippers (*Cypripedium spectabile*) or Wood Lilies (*Trillium grandiflorum*). This happy idea is worth a trial, as the species named bloom at different seasons and would probably not compete with one another. In this country, the leaves of Tricyrtis often do not remain in good condition throughout the season.

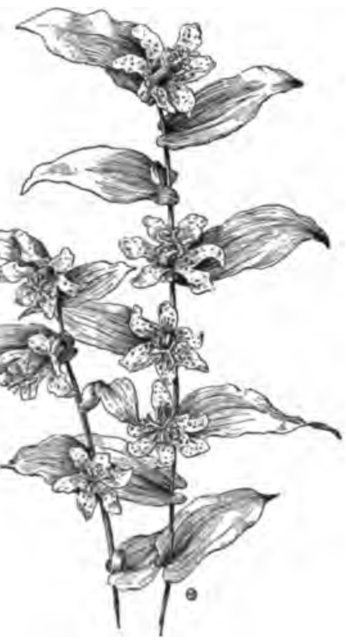
Tricyrtis is a genus of 6 species native to Japan, China and the Himalayas. The plants average 2 or 3 ft. in height and have numerous lvs., green on both sides and with many parallel nerves. Fls. bell-shaped, then spreading; perianth-segments lanceolate, acute: ovary sessile, 3-celled; ovules crowded, superposed: capsule leathery, 3-valved: seeds minute. Tricyrtis is one of the aberrant types of the lily family. It is placed by Bentham and Hooker in the Uvularia tribe in which it is the only genus with a septicidal capsule. Monographed in Latin by J. G. Baker in Journ. Linn. Soc. 17:463 (1880). In this account the lvs. of *T. macropoda* are said not to be stem-clasping, but in B.M. 5355 they are described and figured as stem-clasping.

All the names given below are American trade names, except *T. flava*, *Formosana* and *latifolia*. The writer has been tempted to include these, partly because there has been no account in English of all the species, but chiefly because they are desirable plants likely to come into cultivation.

A. *Base of lvs. not stem-clasping*.... 1. **Formosana**
AA. *Base of lvs. clasping the stem.*
B. *Stem pilose, with spreading hairs.* 2. **hirta**
BB. *Stem not prominently hairy, puberulous or very slightly pilose.*
C. *Fls. yellow, unspotted*........... 3. **flava**
CC. *Fls. spotted, not yellow.*
D. *Spots rather large*............ 4. **pilosa**
DD. *Spots minute.*
E. *Style as long as the stigmas.* 5. **latifolia**
EE. *Style half as long as stigmas.* 6. **macropoda**

Formosàna, Baker. Stem flexuous, 1 ft. high: lvs. sessile, oblanceolate, wedge-shaped at the base: fls. few in a lax corymb, whitish purple, scarcely spotted. Formosa.—Unique by reason of its lvs. not being stem-clasping.

hirta, Hook. (*T. Japónica*, Miq.). Fig. 2569. Stem 1–3 ft. high, everywhere clad with soft, whitish, spreading hairs: fls. 6–15, racemose or subcorymbose, whitish, the outer segments covered with rather large purple spots. Wide-spread in the woods of Japan. B.M. 5355. Gn. 30, p. 431; 49:1062. V. 12:204.—Var. **nigra**, Hort. (*T. nìgra*, Hort.), has black instead of purple spots. Gn. 49:1062. A form with variegated lvs. was once offered by Pitcher & Manda.



2569. Tricyrtis hirta (× ⅓).

flàva, Maxim. Stem dwarf: lvs. oblong-lanceolate: fls. racemose, yellow, not spotted. Seen by Maximowicz in the gardens of Yedo only.

pilòsa, Wall. Stem 2–4 ft. high, very slightly pilose: lvs. oblong: fls. numerous, loosely corymbose, whitish, with large purple spots; style half as long as the stigmas. Himalayas, 5,000–6,000 ft. B.M. 4955 (perianth-segments narrow, oblong). F.S. 12:1219.

latifòlia, Maxim. Stem glabrous, flexuous, 2–3 ft. high: lvs. broadly oblong or the uppermost ovate: fls. few in a terminal corymb, whitish, with minute purple spots; style as long as the stigmas. Japan.

macrópoda, Miquel. Stem 2–3 ft. high, puberulous above: lvs. oblong: fls. in a loose corymb, whitish purple, with minute purple spots: style half as long as the stigmas. Blooms in June and July, according to J. B. Keller. Japan, China. B.M. 6544 (segments broadly ovate, decidedly yellow, spotted red and veined red near tips).—In F.S. 18:1820 is figured a plant with sessile lvs. striated with white, and no fls., which he refers to *T. macropoda*. This was sent out by Van Houtte as *T. hirsuta*, but it is a glabrous plant and probably lost to cultivation.

T. grandiflòra, Hort., should be compared with T. hirta, var. nigra. It is a name scarcely known to botany. Ellwanger & Barry say it has orchid-like, fragrant fls. in Oct. and Nov. (Baker says the genus has no fragrant fls.) Krelage says that T. grandiflora has white fls. mottled with black. W. M.

TRIENTÀLIS (Latin for the third of a foot; referring to the height of the plant). *Primulàceæ.* STAR FLOWER. CHICKWEED-WINTERGREEN. A genus of two species of low, glabrous, hardy perennial herbs: stems simple, with small scales on leaves below and a whorl-like cluster of larger, nearly sessile leaves at the summit, from the axils of which in spring the star-like white or pink flowers are borne singly on slender peduncles. Sometimes grown in wild garden borders

A. *Lvs. acuminate at both ends.*

Americàna, Pursh. Stem naked below, 5–9-lvd. at the summit: lvs. lanceolate: divisions of the white corolla finely acuminate. Damp woods, Labrador to Va. V. 8:380.

AA. *Lvs. obtuse (acute in var. latifolia).*

Europæ̀a, Linn. Stem either naked or with a few scattered lvs. below the cluster of obovate or lanceolate, oblong, obtuse or abruptly somewhat pointed lvs.: divisions of the white or pink corolla abruptly acuminate or mucronate. Alaska, Eu. and Asia.—Var. **árctica**, Ledeb. Dwarf: lvs. 1 in. long, decreasing below: corolla white. Var. **latifòlia**, Torr. Stem naked below the cluster of 4–7 oblong-obovate, or oval, mostly acute lvs.: corolla white to rose-red. Woods, western California to Vancouver's Island. F. W. BARCLAY.

TRIFÒLIUM (name refers to the three leaflets). *Leguminòsæ.* CLOVER. Trifolium is a large genus, comprising between 200 and 300 species, most abundant in the north temperate zone. They are low herbs, with digitately 3-foliolate (rarely 5–7-foliolate) lvs., stipules adnate to the base of the petiole, and small papilionaceous flowers mostly in dense terminal heads or spikes. The calyx is 5-toothed, the 2 upper teeth sometimes connate; petals 5, mostly withering rather than falling, more or less adnate to the base of the stamen-tube; stamens 9 and 1: ovary small, ripening into a little few-seeded, mostly indehiscent pod. The flowers are usually in shades of red and running into white, rarely yellow.

The Clovers are very important agricultural plants, but they have little distinctly horticultural value except as cover-crops and green manures. See *Clover*, p. 337. For the rôle of Clovers as nitrogen-fixers, see *Legumes*, p. 897. The species described below are offered mostly as forage plants. Many Clovers are perennial, although they are of relatively short life, so that frequent resowing is necessary if plants are to be kept in robust condition. Some of the species are annual, and these tend to become weeds. All are propagated readily by means of seeds; but as the seeds are small and oily, they may not germinate well in dry, hot soils. Three annual yellow-flowered species are weeds in some parts, particularly in the East, where they have been introduced from Europe: *T. agrarium*, Linn., Yellow or Hop Clover, with oblong-obovate sessile lfts.; *T. procumbens*, Linn., Low Hop Clover, more spreading, lfts. obovate and the terminal one stalked; *T. dùbium*, Sibth., with lfts. truncate or emarginate at apex and the terminal one stalked. A silky-pubescent white-fld. annual species, from Europe, *T. arvense*, Linn., is the Rabbit-foot

Clover of fields and waste places. The *T. odoratum* of some seedsmen is evidently Melilotus. Allied genera are Lespedeza, Medicago and Melilotus.

A. *Flowers in a long spike.*

incarnàtum, Linn. CRIMSON or SCARLET CLOVER. Fig. 499, Vol. I. Annual, erect, 1–3 ft. high, soft-hairy: lvs. long-stalked, the lfts. broadly obovate and denticulate and sessile or nearly so by a cuneate base, the stipules large and thin and veiny and somewhat toothed: heads becoming 2–3 in. long, very dense: fls. sessile, bright crimson and showy, the calyx sharp-toothed and hairy. S. Eu. B.M. 328.—An escape in some places. Now much used as a cover-crop in orchards. See *Cover Crops*. It is very showy when in bloom. If seeds are sown at midsummer or later, the plants may be expected to survive the winter and bloom early in spring.

2570. Trifolium repens—the White Clover (× ⅛).

rùbens, Linn. Perennial, 20 in. or less tall, in clumps, the stems erect: lvs. short-stalked, the lfts. oblong-lanceolate and strongly denticulate, the stipules long-lanceolate: heads usually in pairs, becoming 3–4 in. long: fls. purplish red, showy.—Eu. Attractive ornamental species. The heads become silky after flowering. There is a white-fld. form.

AA. *Flowers in globular or ovate heads.*

B. *Corolla yellow.*

filifórme, Linn. YELLOW SUCKLING CLOVER. Annual, of diffuse growth: lfts. obovate or obcordate, somewhat denticulate, the terminal one stalked, the stipules broadly ovate: peduncles long and filiform, bearing sessile yellow fls. in umbel-like heads, the calyx-lobes unequal. Eu.—Sometimes used for forage or grazing.

BB. *Corolla white or ochroleucous (yellowish white).*

Alexandrinum, Linn. EGYPTIAN CLOVER. Annual, with few appressed hairs, the stems tall, erect or ascending and branching: lvs. numerous, the lfts. oblong or lanceolate and somewhat denticulate, the stipules lanceolate-subulate and partly free from the petiole: head stalked or sessile, ovate, becoming oblong-conic in fr.: fls. ochroleucous. Egypt, Syria, etc.

Pannónicum, Jacq. HUNGARIAN CLOVER. Perennial, very hairy, the stems usually simple, 2 ft.: lfts. lance-oblong and subacute to retuse, ciliate and entire, the stipules narrow and longer than the short petioles: heads ovate-oblong stalked: fls. pale yellowish white or creamy yellow. Eu., Asia.—Handsome plant for the border; also recommended for forage.

rèpens, Linn. WHITE CLOVER. Fig. 2570. Low creeping glabrous perennial: lvs. long-stalked, the lfts. obcordate and obscurely toothed, the stipules small and scale-like: heads long-peduncled from the ground, small and loose: fls. white, fragrant. Eu. and thought to be native in the northern part of the U. S. and in Canada, but naturalized everywhere.—Much used in lawns, and in some parts prized for pasture. There are forms with red and purplish foliage. This is thought by most authorities to be the shamrock of Ireland. A form of it is offered by Blanc, as *T. minus*, "the genuine Irish shamrock." See *Shamrock*.

BBB. *Corolla rose-tinted or red.*

C. *Individual fls. pediceled.*

hỳbridum, Linn. ALSIKE or SWEDISH CLOVER. Ascending or nearly erect, 1–3 ft. high, branching, glabrous: lvs. long-stalked, the lfts. obovate and serrulate, stipules ovate-lanceolate and thin: heads small and loose, nearly globular, long-stalked: fls. rose-colored or sometimes white on the top of the head. Eu. B.M. 3702.—A good forage plant; also naturalized. Thrives best on moist lands. Very hardy. Perennial.

CC. *Individual fls. sessile.*

D. *Plant perennial.*

praténse, Linn. (*T. praténse perénna*, Hort.). COMMON RED CLOVER. PEA-VINE CLOVER. COW-GRASS. Fig. 2571. Ascending and somewhat hairy, 1–1½ ft.: lvs. long-stalked, the lfts. oval or obovate and sometimes notched at the end and the blade marked with a large spot, the stipules broad but with a bristle point: heads globular-ovate, sessile: fls. red-purple. Eu., but everywhere introduced, and much grown for pasturage hay, and green manuring.

mèdium, Linn. MAMMOTH or ZIGZAG CLOVER. Stouter and less erect: lfts. oblong and entire and without spots: heads usually stalked, and fls. rather deeper colored. Eu., and introduced, and much grown by farmers.

DD. *Plant annual.*

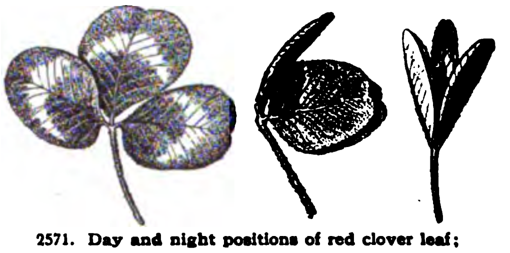
resupinàtum, Linn. (*T. suavèolens*, Willd.). Annual, diffuse or trailing glabrous plant: lfts. obovate and serrulate and as long as the petiole, the stipules lanceolate-acuminate: heads globose, with rudimentary involucre: fls. purple. Greece, Egypt to Persia.—Grown for ornament.

L. H. B.

TRIGONÉLLA (Latin, *a little triangle;* probably referring to the shape of the fls.). *Leguminòsæ*. Includes Fenugreek, which see. Trigonella is a polymorphous genus of about 50 species widely scattered in the eastern hemisphere. The genus belongs to the Trifolium tribe of the legume family, being distinguished from the clovers and allied plants mainly by the fact that the lvs. are pinnately trifoliolate and by the obtuse keel of the flower. The inflorescence and pod are too various to be described here. Bentham and Hooker divide the genus into 6 sections, of which Fenugreek and other species form a section characterized by having whitish, subsessile fls. and a thick, oblong or linear pod which has a long beak and obliquely longitudinal veins.

Fœnum-Græ̀cum, Linn. FENUGREEK, which see. White-fld. annual, 1–2 ft. high, blooming in June and August. Distinguished from other species in its section by the erect, unbranched stem and obovate lfts., which are obscurely dentate. Stipules lanceolate-falcate, entire: calyx pilose: pods falcate, twice as long as the beak. Eu., Orient.

W. M.



2571. Day and night positions of red clover leaf; unfolding young leaf at the right.

TRÍLISA (anagram of Liatris). *Compósitæ*. Here belongs a native perennial herb known as the Vanilla Plant, from the odor which the leaves emit when bruised. It is not, however, the vanilla plant of commerce (see *Vanilla*). Trilisa is a genus of two species closely related to Liatris. The species are autumn-blooming plants 2–3 ft. high, with numerous small flower-heads of purple or white. They differ from Liatris as follows: The roots are fibrous (those of Liatris being tuberous); the inflorescence is panicled instead of racemose or spicate, and the involucral bracts are in only 2 or 3 series, while those of Liatris are in many series. Trilisa is not so well known to gardens as the Blazing Star. Although a native of the low pine barrens from Va. to Fla. and La., it is perhaps hardy. Twenty years ago it was advertised by a Massachusetts dealer in native plants. It is mentioned in some English books as a hardy plant, thriving in light soil and prop. by division or by seeds sown in autumn. It is more fully described in our native botanies.

odoratissima, Cass. (*Liàtris odoratissima*, Michx.). VANILLA PLANT. Also called Carolina Vanilla, Dog's-tongue, etc. Rather stout, glabrous, perennial herb, 2–3 ft. high: lvs. thick, entire or sometimes dentate, obtuse, 4–10 x 1–1½ in., oblong, ovate or oval: inflorescence corymbose paniculate: fl.-heads about ¼ in. long. Aug., Sept. B.B. 3:319.—The other species (*T. paniculata*, Cass.) has a similar range and is distinguished by its viscid-pubescent stem and thyrsoid-paniculate inflorescence.

W. M.

TRÍLLIUM (Latin, *triplum*, triple: leaves and floral parts in threes). *Liliàceæ*. WAKE-ROBIN. BIRTHROOT. WHITE WOOD LILY. GROUND LILY. Twelve species of tuberous-rooted spring-flowering herbs in North America, and about half as many more in Asia from Himalaya to Japan. All the American species and none of the others are in the trade in this country. The stem is simple and erect, 3-leaved near the summit and bearing one flower with 3 green sepals, 3 white or colored distinct petals, 6 short stamens, and a 3-loculed ovary which ripens into a red or purple berry-like fruit. For a botanical account of the American species, see S. Watson, Proc. Amer. Acad. Arts & Sci. 14 (1879).

Trilliums are amongst the characteristic flowers of American woods. The best known species is *T. grandiflorum*, which ranges from Canada to the mountains of North Carolina and extends westward beyond the Great Lakes. All Trilliums delight in moist, rich soil. They thrive in woods mold. The root is a deep-seated perpendicular tuber or rhizome (Fig. 2572). It is customary to transplant Trilliums from the woods when in bloom. This is because the plants can be found readily at that time and because the desire to grow them is strongest when the plants are in bloom. It is better to transplant in midsummer, or later, however, when the growth is completed, although the plants are difficult to find after the tops have died. The bloom is made largely from the energy stored in the tuber the previous season. After flowering, the plant stores energy for the succeeding year. By midsummer this work is accomplished and the tops die: then the plants are at rest and they are in proper condition to be moved. However, good results are sometimes obtained by moving them in spring. These remarks will apply to most early spring-blooming small herbs. Give Trilliums a rich, deep, rather moist soil in partial shade. Plant deep. A colony will last for years. Trilliums force well. See *Forcing*. Plants may be propagated by seeds sown as soon as ripe. Blooming plants may be expected in two or three years. Trilliums are among the choicest of all early spring plants, and they should be more common in gardens. They can be made to thrive well in borders about-city yards. They may also be colonized in grass where the lawn mower is not used. Best results are usually attained, however, when they are planted alone in masses. Trilliums are amongst the relatively few plants that are very showy and yet not coarse.

2572. Vertical rhizome of Trillium (× ½).

INDEX.

album, 9.
angustipetalum, 3.
Californicum, 3.
Catesbæi, 11.
cernuum, 10.
discolor, 3.
erectum, 9.
erythrocarpum, 2, 7.
fœtidum, 9.
giganteum, 3.
grandiflorum, 7.
lanceolatum, 4.
nervosum, 11.
nivale, 1.
Nuttallii, 3.
ovatum, 8.
pendulum, 9.
petiolatum, 6.
pictum, 2.
purpureum, 9.
pusillum, 12.
recurvatum, 4, 5.
rubrum, 3.
sessile, 3.
stylosum, 11.
undulatum, 2.
viridescens, 3.
viridiflorum, 9.
Wrayi, 3.

A. *Ovary 3-angled, not winged.*

1. **nivale**, Ridd. A dwarf species, 5 in. or less high, early: lvs. narrow and obtuse, 1–2 in. long: fls. white. on a short erect or declined pedicel, the petals about 1 in. long, narrow and nearly or quite obtuse. Low woods, Pa. and Ky. to Minn. and Iowa. B.M. 6449.

2. **undulàtum**, Willd. (*T. erythrocàrpum*, Michx. *T. píctum*, Pursh). Of medium to large size, 1 ft. or more high: lvs. large, ovate and acute or acuminate, short-stalked: fls. rather large, white, on a short but slender erect or inclined pedicel, the petals oblanceolate and wavy, about 1 in. long and usually purplish at the base. Woods, Nova Scotia to Missouri and Georgia. B.M. 3002. L.B.C. 13:1232.

2573. Flower of Trillium grandiflorum (× ½).

AA. *Ovary 6-angled, often winged.*

B. *Flowers sessile (and mostly colored).*

C. *Leaves sessile.*

3. **séssile**, Linn. Strong-growing, 1 ft. or less high: lvs. broadly ovate or rhomboidal, acute, more or less spotted: fl. sessile in the whorl of lvs., small, purple or greenish, the petals narrow and acute. Woods, Pa. to Minn., Ark., and Fla. B.M. 40. L.B.C. 9:875. F.S. 22:2311.—Variable.

Var. **giganteum**, Torr. (var. *Califórnicum*, Wats.). Much stouter, the lvs. often 6 in. long and spotted, and the petals sometimes 4 in. long: fls. purple, rose-color or white, the petals rhombic-ovate or narrower. Calif. and Ore. G.F. 3:321.

Var. **angustipétalum**, Torr. Similar to Var. *giganteum*, but the lvs. somewhat petiolate and the petals narrower. Calif., Ore. Apparently not in the trade. This and var. *giganteum* appear to be the only Trilliums native to California, except *T. ovatum*.

Var. **rùbrum**, Hort. A form of Var. *giganteum* with fls. deep red-purple.

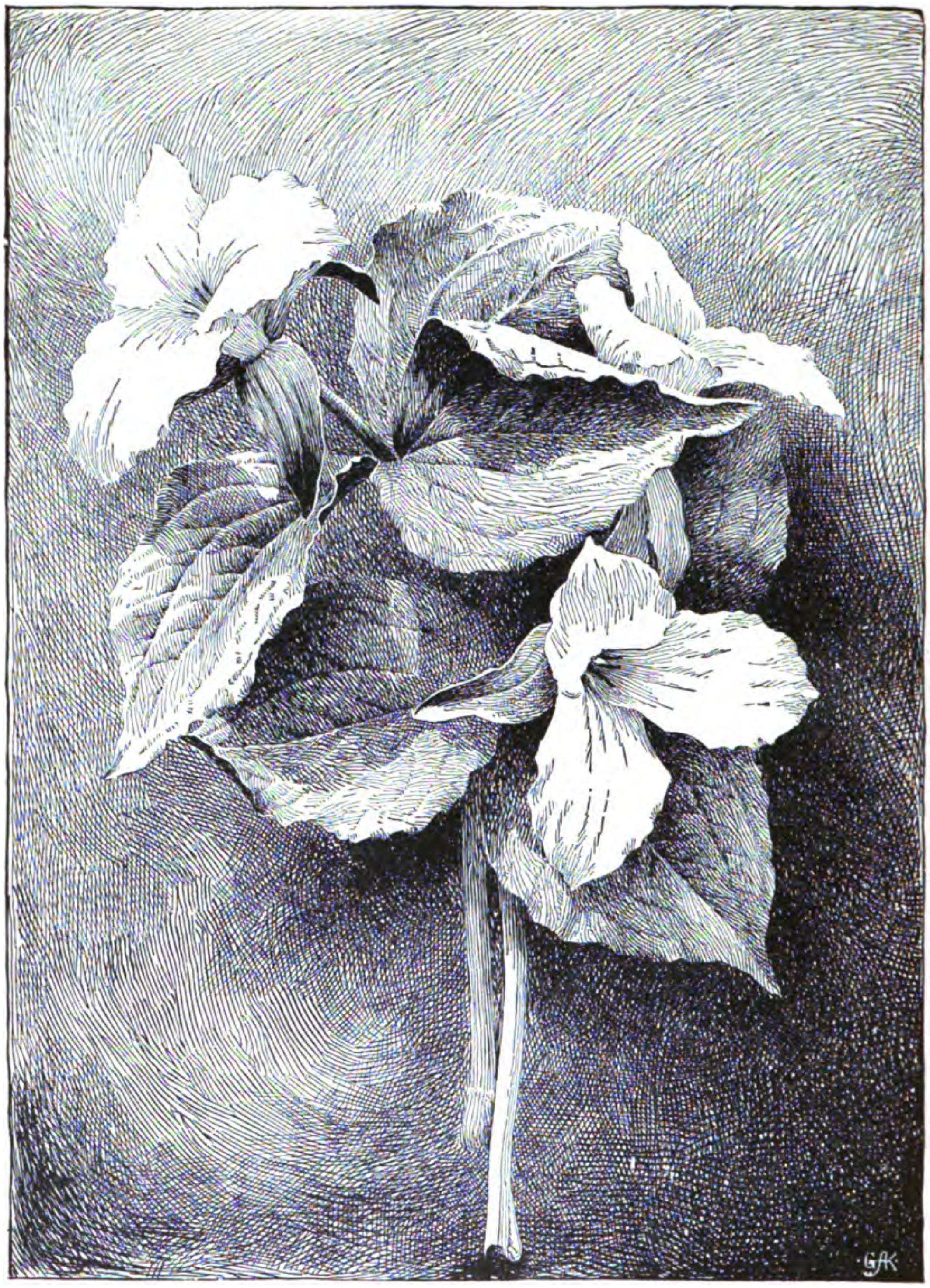
Var. **Wràyi**, Wats. (*T. díscolor*, Wray). Petals spatulate-obtuse, 1 in. long, greenish. Georgia. B.M. 3097.

Nùttallii, Wats. (*T. viridéscens*, Nutt.). Lvs. pubescent beneath, as also the upper part of the stem: petals linear-lanceolate, purplish green with brown base. Ark.

4. **lanceolàtum**, Boykin (*T. recurvàtum*, var. *lanceolàtum*, Wats.). Plant often more than 1 ft. tall: lvs. lanceolate, sessile: fls. dull or brown-purple, an inch or more long, narrow-lanceolate or linear, the sepals ascending or somewhat reflexed, the filaments usually exceeding ¼ in. in length. Ga., Ala.—Little known in cult.

CC. *Leaves stalked.*

5. **recurvàtum**, Beck. Strong-growing, usually 1 ft. or more high: lvs. ovate or ovate-oblong, tapering to both ends, on short but slender petioles: fls. brown-purple or dull-purple, about 1 in. or more long, the



2574. Trillium grandiflorum, the commonest Wake Robin. Nearly full size.

petals narrow and erect, the sepals narrow and reflexed. Woods, Ga. to Minn., Miss. and Ark.

6. **petiolàtum**, Pursh. Stem scarcely arising above the ground: lvs. ovate-elliptic to reniform, with stalks as long as the blade or even longer (blade 3–5 in long): fls. purple, the petals 1–2 in. long and narrow-oblanceolate, the sepals erect. Idaho, Ore., and Wash. Little known in cult.

BB. *Flowers stalked.*

C. *Pedicel longer than the flower: lvs. nearly or quite sessile.*

7. **grandiflòrum**, Salisb. Figs. 854 (Vol. II), 2573, 2574. Stout, 1 ft. or more high: lvs. broad-ovate or rhombic-ovate, narrowed to both ends, often wavy: fls. erect or nearly so, pure white, changing to rosy pink as they fade, 2–3 in. long, the petals broadly oblanceolate and spreading and much longer than the sepals. Quebec to Minn., Fla. and Mo. B.M. 855 (as *T. erythrocarpum*). L.B.C. 14:1349. Gn. 29, p. 257; 36, p. 394; 40:821. G.M. 33:131. Mn. 4:17. A.G. 17:243. Gng. 4:305; 6:161.—Sporting forms are not uncommon. Sometimes forms occur with petiolate lvs. A.G. 1892:206. *T. grandiflorum* is the best and handsomest species for cultivation.

2575. Trillium erectum (X ⅓).

8. **ovàtum**, Pursh. Much like *T. grandiflorum*, but the petals narrow-lanceolate or narrow ovate, the sepals usually nearly as long as the petals: plants 1 ft. or less high: lvs. ovate to nearly orbicular, often somewhat rhombic. Calif. to B. C.—The Pacific coast representative of *T. grandiflorum*.

9. **eréctum**, Linn. (*T. péndulum*, Willd. *T. purpùreum*, Kinn. *T. fœtidum*, Salisb.). Figs. 2575, 2576. Stout, 1 ft. or more high: lvs. broadly rhombic-ovate: pedicel usually bent over or inclined but sometimes erect: fls. brown-purple to greenish purple, the petals usually about 1 in. long, ovate to lanceolate, not much if any exceeding the sepals. Nova Scotia to Manitoba, N Car. and Mo. B.M. 470. L.B.C. 19:1838. F.S. 10:990. Mn. 2:49. G.C. II. 19:605. The fls. of *T. erectum* are ill-smelling.

Var. **álbum**, Lodd., has white fls. B.M. 1027. L.B.C. 19:1850.

Var. **viridiflòrum**, Hook. Fls. greenish. B.M. 3250. Not known to be in the trade.

CC. *Pedicel generally not exceeding and usually shorter than the flower.*

D. *Fl. declinate under the lvs.*

10. **cérnuum**, Linn. Plant 1 ft. or more high: lvs. very broadly rhombic-ovate, nearly or quite sessile: fls. white, the petals 1 in. or less long, ovate-lanceolate, wide-spreading or reflexed, undulate, equaling or exceeding the sepals. Newfoundland to Ga. and Mo. B.M. 954. Mn. 10:49.

11. **stylòsum**, Nutt. (*T. nervòsum* and *T. Càtesbæi*, Ell.). Slender, 12–18 in. high: lvs. ovate-lanceolate, narrow at each end, short-stalked: fls. rose-color, the petals oblong, obtuse or acute, curved, undulate, sometimes 2 in. long. N. C. to Fla.

DD. *Flower erect.*

12. **pusillum**, Michx. Small, usually not 1 ft. high: lvs. lanceolate or oblong, obtuse, sessile: fls. pale flesh color, less than 1 in. long, on a short erect pedicel, the petals lanceolate and exceeding the obtuse sepals.

T. Goveniànum, Wall. A species of temperate Himalaya, little known and described by Hooker as follows: "Lvs. shortly petioled, ovate or ovate-cordate, acute: sepals subequal, narrowly linear."—*T. obovàtum*, Pursh. Founded on a Canadian plant, which has been referred to T. erectum. Maximowicz keeps it distinct, however, extending its range to Kamtschatka and Japan. It is the T. erectum, var. Japonicum, Gray. According to Watson, the Japanese plant "is distinguished by a somewhat produced connective [between the anther-cells] and very short stigmas." Maximowicz says that the plant differs from T. erectum in the petals being broader and more obtuse and longer than the calyx, the fls. nodding from the first, and the lvs. broader than long, sessile, not attenuate at the base.—*T. Smállii*, Maxim. One of the T. erectum series (T. erectum, var. Japonicum flore pleno, Gray), of Japan. Fls. smaller than those of T. obovatum (2 in. across), deep tawny red, the petals not exceeding the sepals, nearly orbicular or obovate.—*T. Tschonóskii*, Maxim. About 1 ft. tall: lvs. sessile, broad-ovate or orbicular, somewhat rhombic, acuminate: fls. dull purple, 1 in. or less across, the petals oblong-lanceolate. According to Hooker, this differs from T. erectum chiefly in the longer filaments." Himalaya to Japan.

L. H. B.

TRIÓSTEUM (name shortened by Linnæus from Triosteospermum, which is from Greek for *three bony seeds*). *Caprifoliàceæ*. FEVERWORT. HORSE GENTIAN. A genus of 3 species of coarse perennial herbs, of which 2 are American and 1 Himalayan. Stems simple: lvs. rather large, pinnately veined, entire or sinuate: fls. dull-colored, sessile, solitary or in small clusters in the leaf-axils, followed by orange or reddish fruits.

perfoliàtum, Linn. Stem 2–4 ft. high, stout: lvs. ovate, shortly acuminate, narrowed below into connate-perfoliate or simply connate base: corolla dull brown-purple. Rich soil, New England and Canada to Ill. and Ala. B.B. 3:234.—Is occasionally offered by collectors. It is a weedy plant of very easy cultivation.

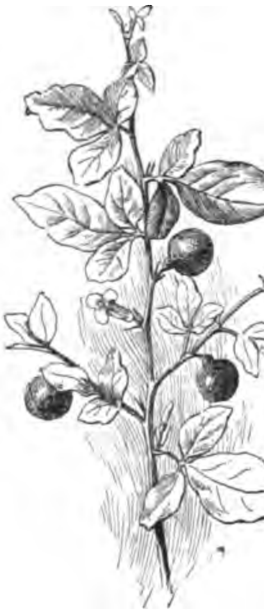
F. W. BARCLAY.

TRIPHÀSIA (*triple;* alluding to the make-up of the flowers). *Rutàceæ*. A small spiny shrub grown for hedges and for ornament, and sometimes for its small berries, which are used for preserves: lvs. alternate, sessile, dark, evergreen, trifoliolate, with small ovate lateral leaflets and much larger obovate central leaflet: thorns slender, about ⅓ in. long, one or two in the axil of each leaf: fls. white, about ⅓ in. long, solitary, or in 3-fid. cymes, axillary; calyx cupulate, 3–4-lobed; petals 3–4, linear-oblong, free, imbricate; stamens 6, free, inserted around a fleshy disk: ovary ovoid, 3-loculed: fr. a small 1–3-seeded berry: seeds oblong, exalbuminous, immersed in mucilage; testa coriaceous, embryo often with unequal plano-convex cotyledons. Only one species.

2576. Trillium erectum.

aurantiola, Lour. (*T. trifoliàta*, DC.). BERGAMOT LIME or LIME BERRY. Fig. 2577. A glabrous spiny shrub with straggling evergreen branches and leaves. Hindostan.—Cultivated in many tropical countries and in greenhouses. Produces an abundance of elliptical or nearly globular, gland-dotted red berries about ⅜–½ in. across. They are sweet and agreeable and are said to be delicious when preserved. In trade catalogues the names *Triphasia aurantiola* and *T. trifoliata* are sometimes erroneously applied to the hardy trifoliolate orange (*Citrus trifoliata*). In the U. S., little known except in S. Fla. It withstands some frost.

H. J. Webber.



2577. Triphasia aurantiola (× ½).

TRÍPSACUM (Greek, *tribo*, to rub or thresh; probably alluding to the ease with which the fertile spike can be broken up). *Gramíneæ*. Species 2 or 3, of the warmer parts of North America, one extending north to central U. S. and in many places furnishing considerable native fodder. Fls. monœcious, in the same spike, the staminate above; spikes terminal and axillary; staminate spikelets 2-fld., in pairs at each joint; pistillate single, 1-fld., imbedded in each joint of the rachis, so that the smooth cartilaginous axis and the outer glume form a nearly cylindrical mass. At maturity the pistillate spikes separate into the joints.

dactyloides, Linn. (*T. violàceum* and *T. Dáctylis* of the trade). Gama Grass. Sesame Grass. Culms in bunches, 4–7 ft.: spikelets 2–3 at summit and often single from the upper axils. Moist soil, Conn., Ill., Kans. and southward.—A wild fodder grass, sometimes cultivated for the same purpose and also in gardens as a curiosity. Raised from seed, or more certainly from cuttings of the rootstocks.

A. S. Hitchcock.

TRISTÁGMA (Greek, *three drops;* alluding to the three nectar glands of the ovary). Including *Stephanolírion*. *Liliàceæ*. A genus of 3 species of bulbous plants from Chile. Radical lvs. few, narrowly linear; scape naked, bearing rather numerous salver-shaped pedicellate fls. in an umbel: perianth-tube cylindrical, sometimes with a crown in the throat; lobes 6, spreading, nearly equal; stamens 6: ovary sessile, 3-loculed, ovoid. Fall-blooming bulbs.

nivàle, Poepp. (*Mílla nivàlis*, Baker). Lvs. 6–9 in. long, about 2 lines wide; scape slender, about 1 ft. long: fls. 1 in. long, 2–8 in an umbel, the segments linear and greenish; crown none.—Offered by Dutch bulb growers.

T. narcissoìdes, Benth. & Hook., does not appear to be in the Amer. trade. It is 1 ft. or more high, with short narrow-linear lvs., and white fls. bearing a bright orange narcissus-like crown of 3–6 broad unequal more or less connate scales.

F. W. Barclay.

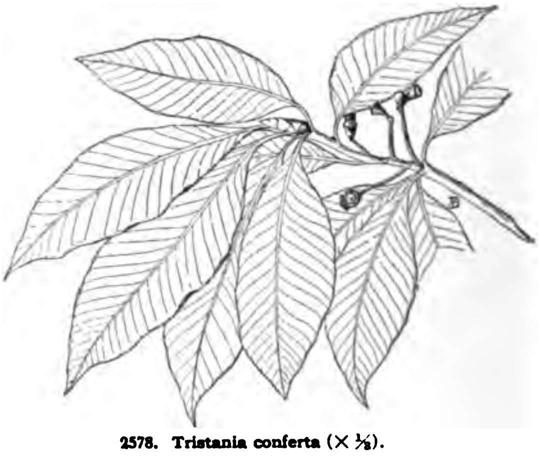
TRISTÀNIA (in honor of Jules M. C. Tristan, 1776–1861, a French botanist). *Myrtàceæ*. A small genus of subtropical evergreen Australasian trees or small shrubs. Lvs. alternate or rarely opposite, somewhat whorled: fls. axillary, pedunculate, cymose, often fragrant; bracts obovate or caducous; calyx-tube turbinate-campanulate, lobes 5; petals 5, spreading; stamens numerous, united in bundles opposite the petals: capsule 3-loculed, many-seeded, partly exserted or inclosed: seeds numerous, wingless, usually linear-cuneate. Cultivated as greenhouse shrubs in N. Europe; hardy in Calif. north to San Francisco, also in Fla. Propagated by half-ripened cuttings in sand under glass, or by seeds.

conférta, R. Br. (*Lophostèmon arboréscens*, Schott.). Brisbane Box. Fig. 2578. An umbrageous tree attaining 150 ft.: young shoots and calyx hoary-pubescent: lvs. 3–6 in. long, ovate-lanceolate, glabrous, usually crowded at the ends of the branches and apparently verticillate: fls. mostly on the branches well below the lvs.; petals about ¼ in. long, white and spotted, fringed. Queensland. B.R. 22:1839 (as *T. macrophylla*).—A handsome evergreen shade tree, valuable for avenues in hot, dry regions, as it withstands great drought; it also produces timber valued for strength and durability. Much grown in New South Wales as a boulevard tree. Hardy in middle California, withstanding an exceptional temperature of 26° Fahr. at Berkeley.

Joseph Burtt Davy.

TRITELEÌA (*three* and *complete;* referring to the 3-merous fls.). *Liliàceæ*. Triteleia has been referred to Milla and Brodiæa; but when the group is restricted to the South American species, it seems to be advisable to keep it distinct. In Brodiæa proper the pedicels are articulated at the apex; in Milla and Triteleia they are not articulated. In Milla the stamens are inserted in one series in the throat of the perianth; in Triteleia they are distinctly in two series in the tube of the perianth. See *Brodiæa* and *Milla*.

About 16 Triteleias are known (see Baker, G.C. III. 20, p. 459). These are of two series,—those with perianth-tube usually as long as the segments, and those with tube shorter than segments. To the former section belongs the common *T. uniflora*, the only species in general cultivation. The species are native to the Andes and Argentina as far east as Buenos Ayres. They are all low grass-leaved bulbous plants, hardy or half-hardy, useful for planting in the border or for spring blooming in pots. Sometimes the odor is unpleasant.



2578. Tristania conferta (× ⅓).

uniflòra, Lindl. (*Milla uniflòra*, Grah. *Brodiæa uniflòra*, Baker). Spring Star-flower. Fig. 2579. Lvs.

narrow-linear, 1 ft. or less long: scapes 8 in. or less tall, bearing a bract-like spathe towards the top: fl. 1 (rarely 2), 1–1½ in. across, pale lilac or pale blue, with pointed segments violet-streaked through the center. Argentina. B.R. 23:1921. B.M. 3327. R.H. 1859, pp. 350, 351. Gng. 2:59.—Hardy in most of the northern states, although it does not persist long. Grown chiefly as a pot-plant for spring bloom. Var. **cærùlea**, Hort., has porcelain-blue flowers. There are other horticultural forms. *T. violacea*, with "delicate violet flowers," is probably a form of this species rather than the *T. violacea*, Kunth, a Chilean species. L. H. B.

TRITHRÌNAX (apparently *triple Thrinax;* application not obvious). *Palmàceæ.* Four species of South American fan palms, one of which was offered for cult. in Fla. in 1889 and is now advertised in southern California. The genus belongs to the Corypha tribe and is distinguished from allied genera chiefly by the following characters: fls. hermaphrodite; petals imbricate; filaments connate into a tube: carpels distinct; styles long, distinct, terminal in fruit.

T. Brasiliensis is a little-known palm. It seems to have been confused in the trade with *Thrinax Chuco*, which is referred in this work to *Acanthorhiza Chuco.* The leaf-segments of the former are bifid; of the latter apparently not. André says the species described below is unique by reason of its sheaths at the base of the leaves. These, he says, "are composed of fibers which are at first parallel and longitudinal, then obliquely intercrossed and finally plaited at right angles like the mats of pandanus in which the coffee of the Antilles and Bourbon is exported. At the summit these narrow strips unite and form a series of very long, robust, recurved spines which are evidently designed to protect the fls. and fruits against climbing animals."

Brasiliénsis, Mart. Trunk slender, 6–10 ft. high, 2–3 in. thick: leaf-segments 22–27, linear, free for two-thirds their whole length, bifid. Brazil. I.H. 22:202.

W. M.

TRÍTICUM (old Latin name for wheat). *Gramineæ.* The genus as now limited comprises two sections, Ægilops, with 12 species of southern Europe and Asia, one of which is thought by some to be the original of our cultivated wheats; and Triticum proper, which includes our cultivated wheats and spelts, that are referred by Hackel to 3 species. Annual grasses with flowers in a terminal spike. Spikelets 2–5-fld. placed flat-wise, singly on opposite sides of a zigzag rachis; empty glumes ovate, 3–many-nerved, these and the fl. glumes more or less awned: grain free. The three species of our cultivated wheats are:

monocóccum, Linn. ONE-GRAINED WHEAT. Spikes compact, the joints readily separating at maturity; spikelets with one awn and usually maturing but one fruit.—The wild form occurs in southern Europe. Cultivated from prehistoric times but now only to a limited extent, and mostly for mush and "cracked wheat," and for fodder.

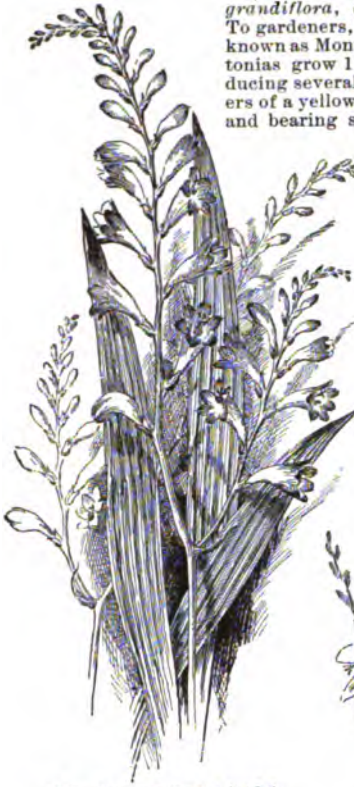
Polónicum, Linn. POLISH WHEAT. Spikes very large, compressed, mostly blue-green.—Original form unknown. It is thought to be a true species because it rarely produces fertile crosses with *T. sativum*, as is also the case with *T. monococcum*, while the races of *T. sativum* among themselves produce fertile crosses. Cultivated in Spain, but not extensively elsewhere.

sativum, Lam. WHEAT and SPELT. Hackel divides the numerous varieties into 3 races: (*a*) SPELTS (*T. spélta*, Linn.). Spikes loose, 4-sided: rachis articulate at maturity. (This race and the next are easily distinguished by the fact that the grain does not fall out when threshed.) One of the oldest of the cultivated grains, the culture of which has decreased till now it is grown only to a limited extent in a few countries in southern Europe. (*b*) EMMERS (*T. dicóccum*, Schrank). Spike very dense, laterally compressed, rachis articulate at maturity. This species has a history similar to Spelt and its cultivation is now confined to certain countries of S. Europe, where it is used chiefly for mush and in making starch. Both of these races are being tested in this country by the Department of Agriculture, and they may prove valuable in the drier regions. (*c*) Wheats. Rachis not articulate at maturity. Grain easily falling out when threshed. There are 4 more or less well-marked sub-races. (1) ENGLISH WHEAT (*T. túrgidum*, Linn.). Empty glumes sharply keeled at base; grain broadly truncate above; leaves usually velvety; flour poor in gluten. To this belong the MIRACLE or EGYPTIAN WHEATS (*T. compósitum*, Linn.), having branched spikes, which originated as a sport. (2) HARD or FLINT WHEATS, MACARONI WHEATS (*T. dùrum*, Desf.). Empty glumes sharply keeled at base; grain narrow and tapering, very hard; awns long and bristly like barley, in some varieties black. Cultivated in Mediterranean countries, especially for making macaroni and similar products, and in Russia, where it is used for making bread, when it is mixed with 10–25 per cent of soft red wheat. (3) DWARF and HEDGEHOG WHEATS. Empty glumes keeled only in upper half. Spikes short and dense, only 3–4 times longer than broad: culms rigid. Grown in mountainous regions of Europe, Chile and Abyssinia. The awned kinds are called Hedgehog wheat. (4) COMMON WHEAT (*T. vulgàre*, Vill.). Glumes as in preceding, but spikes longer and looser. There are many varieties grown in this country,—some naked or awnless ("smooth"), others awned or bearded, some with glumes smooth, others with glumes pubescent ("velvet chaff"). Spring wheats are planted in the spring and winter wheats in the fall, the former group of varieties being grown in the more northerly regions. A. S. HITCHOOCK.

2579. Triteleia uniflora (× ¼).

TRÌTOMA. See *Kniphofia.*

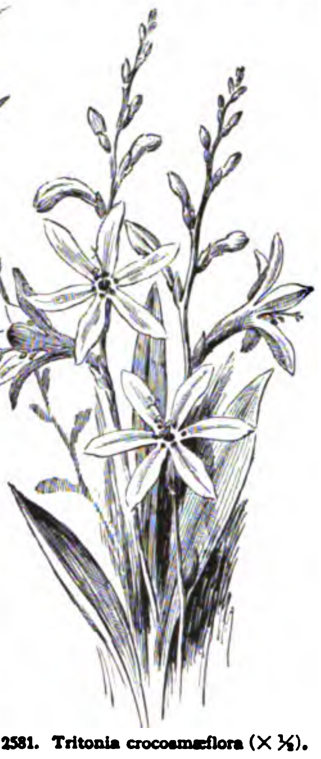
TRITÒNIA (name explained as follows by Ker-Gawler, its author: "Name derived from *Triton*, in the signification of a vane or weathercock; in allusion to the variable direction in the stamens of the different species"). Including *Montbrètia.* *Iridàceæ.* BLAZING STAR. A genus of South African bulbs (plants really cormous), allied to Crocosmia, Acidanthera, Sparaxis and Gladiolus. Baker admits 31 species (Handbook of the Irideæ, 1892). Few of them are in general cultivation, although many of the species have been introduced at one time or another. Those of the Montbretia class are showy, hardy summer-flowering bulbs, to be handled like Gladioli; or they may be left in the ground perma nently if given protection of mulch in cold climates. As far north as New York and Mass., however, they are usually best wintered in damp (not wet) earth indoors. The best known kinds are *T. crocosmæflora* and *T. Pottsii.* Most of the Latin names in catalogues belong to these, as *sulphurea*, *Tigridia pyramidalis*, *grandiflora*, *elegans*, *floribunda*. To gardeners, Tritonias are usually known as Montbretias. Garden Tritonias grow 1 ft. or more tall, producing several to many showy flowers of a yellow, orange or red color, and bearing several stiffish linear or sword-shaped leaves. Corms small, covered with strongly reticulated sheaths or tunics. The perianth is tubular, with a spreading limb of obovate or oblong, nearly equal segments. The stamens are 3, inserted in the perianth-tube, with mostly versatile anthers and filiform filaments. The pistil has a 3-loculed ovary, filiform 3-branched style, ripening into a 3-valved capsule.



2580. Tritonia Pottsi (× ¼).

A. *Perianth-segments obovate.*

crocàta, Ker-Gawl. Slender, simple or branched from near the base, bearing few fls. in loose 1-sided racemes: fl. about 2 in. across, tawny yellow or orange-red, the stamens one-third the length of the perianth-limb. Cape Colony. B.M. 184 (as *Ixia crocata*). Gn. 54:1181.—Var. **miniàta,** Baker (*T. miniata*, Ker-Gawl.), has light red fls. B.M. 609. There are color varieties, as **purpùrea, coccìnea, aurantìaca.** These plants are usually treated as greenhouse bulbs in the North.



2581. Tritonia crocosmæflora (× ⅓).

AA. *Perianth-segments oblong.*

ròsea, Klatt. Tall and branched, with short linear lvs. and loose 6–15-fld. racemes: fl. bright red, with oblong segments (the three lower ones yellow blotched at the base) as long as the tube and anthers just protruding from the tube. Cape Colony. B.M. 7280.—Can be left in the open as far north as Mass., if well protected, but are usually safer if taken up.

Póttsii, Benth. (*Montbrètia Póttsii*, Baker). Fig. 2580. Strong, branching plant 2–4 ft. tall, with several lax racemes, and few or several firm narrow lvs.: fl. about 1 in. long, bright yellow tinged red, the tube broadly funnelform and twice longer than the oblong unequal ascending segments, the stamens about half the height of the limb. Natal, Transvaal, etc. B.M. 6722. G.C. III. 7:301, showing how the corms form one above the other.

crocosmæflòra, Lemoine (*T. Pottsii* × pollen of *Crocosmia aurea* [Fig. 582, Vol. I]). Fig. 2581. Slender, much branching, erect plant 3–4 ft. high, with several or many sword-shaped lvs., and loose, more or less distichous racemes: fls. 2 in. across, orange-crimson, with a slender curved tube nearly or quite equaling the oblong spreading segments. R.H. 1882:124. Gn. 25, p. 363; 31:598. G.M. 36:484.—*Crocosma aurea* was introduced (into England) in 1847, and *Tritonia Pottsii* (into Scotland) in 1877 by G. H. Potts. Victor Lemoine, Nancy, France, hybridized the two, and the product, *T. crocosmæflora*, bloomed in 1880. This hybrid is now the most popular of Tritonias (or Montbretias).

T. aùrea, Pappe. See Crocosmia aurea.—*T. críspa*, Ker-Gawl. Fl. whitish or pale pink, with oblong obtuse segments, and with crisped lvs. B.M. 678.—*T. deústa*, Ker-Gawl. Differs from T. crocata in having a purple-black blotch on the claw of the 3 outer segments. B.M. 622.—*T. flàva*, Ker-Gawl. Fls. bright yellow, the segments oblong and the 3 lower ones with a callus in the throat: lvs. very short. B.R. 9:747.—*T. hyalìna*, Baker. Differs from T. crocata in having the perianth-segments narrowed at the lower part into a claw with hyaline margin. B.M. 704, as T. fenestralis.—*T. lineàta*, Ker-Gawl. Fls. white or pink, with short oblong segments and protruding anthers, of the shape of gladiolus flowers. B.M. 487 (as Gladiolus lineatus).—*T. scillàris*, Baker. Small and slender: fls. pink, with wide-flaring narrow segments, ixia-like. B.M. 629 (as Ixia polystechya).—*T. securígera*, Ker-Gawl. Lvs. short: fls. red or copper-colored, the 3 lower segments with a callus on the claw. B.M. 383 (as Gladiolus securiger).—*T. undulàta*, Baker. Lvs. short and narrow, much crisped: fls. pink, with oblong equal segments. B.M. 599 (as Ixia crispa).—*T. víridis*, Ker-Gawl. Lvs. plane or crisped, linear: fls. green, with nearly equal oblanceolate segments. B.M. 1275.—*T. Wilsoni*, Baker. Lvs. very narrow linear; racemes simple or forked, lax, few-fld.: fls. white, tinged with purple, the segments obovate-cuspidate.

L. H. B.

TRÓLLIUS (old German *trol*, something round; in allusion to the shape of the flowers.) *Ranunculàceæ*. GLOBE FLOWER. A group of neat, hardy, herbaceous perennials of about 10 species, mostly found in marshy places, of the north temperate zone. Roots fibrous, thickened: lvs. palmately divided or lobed: fls. large, solitary, yellowish or purplish; petals 5 to many, small, unguiculate, with a nectariferous pit at the base of the blade: stamens many: carpels 5 to many, sessile, many-ovuled: follicles in a head. Plants of this genus grow freely in a mixture of sandy loam and peat, and in rather damp situations. They may be increased either by seeds, or by dividing the old plants; but the young plants grow slowly at first, and will not flower before the second season from seed.

A. *True petals shorter than the stamens.*
  B. *Plant with true stem, ½ to 2 ft. high*..1. **laxus**
  BB. *Plant with scapes or scape-like stems seldom over 3 or 4 in. high*........2. **acaulis**
AA. *True petals longer than the stamens.*
  B. *Lvs. only 5-parted: lfts. somewhat lobed, cleft and toothed: sepals hardly spreading*..................3. **Europæus**
  BB. *Lvs. smaller, bronze-green; lfts. more finely lobed, cleft and toothed: sepals spreading*..................4. **Asiaticus**

láxus, Salisb. Slender, weak stems, ½–2 ft. long, somewhat ascending: radical and lower stem lvs. long- or short-petioled: all the lvs. 5–7-parted; lfts. cuneate and much cleft and toothed: fls. usually solitary, 1 to 2 in. across; sepals 5–7, entire or toothed at the end, more spreading than the other species; petals many, much shorter than the stamens: follicles ¼ in. long, straight beak one-fourth as long: head of fruit ¾ in. across. Bogs and damp places, Mich. to New Eng. and Del. May–July or Aug. B.M. 1988. B.C. 56 (both as *T. Americanus*).

Var. **albiflòrus**, Gray. (*T. Americànus*, Hook.) Much like the type but usually lower, more slender: lfts. usually 5: fls. pale or white: petals nearly equaling the stamens. Mountain tops, Colo., northward and westward.

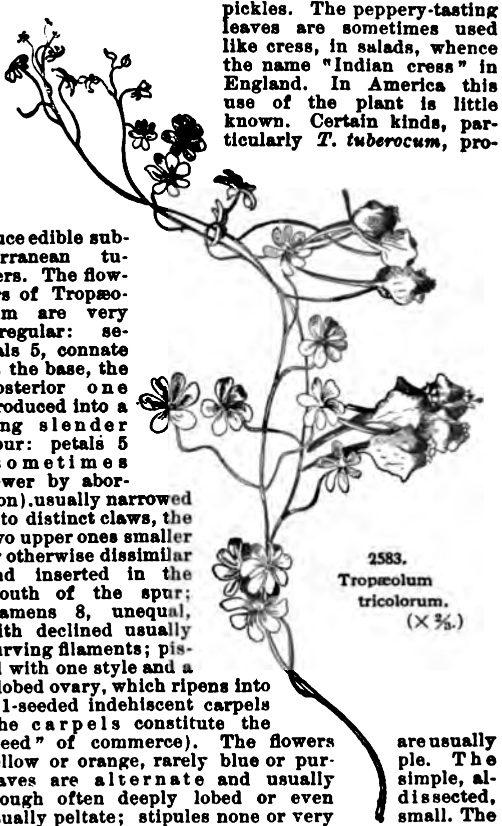
acaùlis, Lindl. Plant only 3 or 4 in. high: lvs. as in the above, or only 5-parted: fls. lemon-yellow, spreading, on stems hardly reaching from the ground; sepals 9, nearly lanceolate, acute, sometimes toothed; petals spatulate, shorter than the stamens. Northern India. B.R. 29:32.

Europæus, Linn. (*T. globòsus*, Lam.). Stems erect, 15 in. or more high, often branching; lower lvs. petioled, others sessile; lfts. only 5-parted, lobed, cleft and toothed, those of the root-leaves on short petioles; fls. of a lemon-yellow color, solitary or in twos, 1–2 in. across, globular in form; sepals 10–15, ovate; petals spatulate, often longer than the stamens: fr. much as in *T. laxus*. Wet upland meadows of N. Eu. May–July. Gn. 40:816.—Var. **Lóddigesii**, Hort., has deep yellow fls.

Asiáticus, Linn. Fig. 2582. Plant much like *T. Europæus*, often taller, the smaller bronze-green lvs. more finely lobed and cleft. fls. a rich orange color with sepals spreading. May. Siberia. B.M. 235.—The blossoms of this are well suited for cut-flower purposes. The plants thrive best and produce richest colors if partially exposed to the sun. *T. gigantèus*, found in garden lists, is a very tall form of this species. *T. Japónicus*, Hort., with large orange fls. in early spring, is by some referred to this species. K. C. DAVIS.

2582. Trollius Asiaticus (× ¼).

TROPÆOLUM (from Greek word for *trophy:* the leaves are shield-shaped and the flowers helmet-shaped). *Geraniàceæ*. NASTURTIUM. About 40 species of soft-growing herbs, mostly climbing, of South America, chiefly of the cooler parts of Peru and Chile. They are grown for their showy odd flowers. The common species, *T. minus* and *T. majus*, are also grown for their young pods and seeds, which are made into pickles. The peppery-tasting leaves are sometimes used like cress, in salads, whence the name "Indian cress" in England. In America this use of the plant is little known. Certain kinds, particularly *T. tuberocum*, produce edible subterranean tubers. The flowers of Tropæolum are very irregular: sepals 5, connate at the base, the posterior one produced into a long slender spur: petals 5 (sometimes fewer by abortion), usually narrowed into distinct claws, the two upper ones smaller or otherwise dissimilar and inserted in the mouth of the spur; stamens 8, unequal, with declined usually curving filaments; pistil with one style and a 3-lobed ovary, which ripens into 3 1-seeded indehiscent carpels (the carpels constitute the "seed" of commerce). The flowers are usually yellow or orange, rarely blue or purple. The leaves are alternate and usually simple, although often deeply lobed or even dissected, usually peltate; stipules none or very small. The species climb by means of the coiling petioles. For references to recent botanical literature on Tropæolum, see F. Buchenau in Engler's Bot. Jahrb. 26, p. 580.



2583. Tropæolum tricolorum. (× ⅗.)

Tropæolums thrive in any warm, sunny, fairly moist place. The tops are tender to frost. For early effects, seeds may be started indoors in pots or boxes. The common climbing species are *T. majus* and *T. Lobbianum*, both of which are very useful for window boxes, balconies, for covering banks and walls, and for growing amongst shrubbery. The common dwarf species, *T. minus*, is earlier and usually more floriferous, and is very useful for the front row in the border. *T. peregrinum*, the Canary-bird Flower, is grown either indoors or in the open. Probably most species are perennial. Many of them are tuberous and withstand some frost at the root; but the half-hardy species are little known in this country.

INDEX.

atropurpureum, 12.
atrosanguineum, 12.
azureum, 1.
brachyceras, 4.
Canariense, 9.
fimbriatum, 11.
Jarrattii, 3.
Leichtlini, 8.
Lobbianum, 11.
majus, 12.
minus, 13.
pentaphyllum, 6.
peregrinum, 9.
polyphyllum, 7.
speciosum, 5.
tricolor, 2.
tricolorum, 2.
tuberosum, 10.

A. *Flowers blue.*

1. **azùreum**, Miers. Very slender glasshouse climber: lvs. peltate, 5-parted nearly or quite to the base, into narrow-obovate or oblanceolate divisions: fls. small, the calyx and short spur green, the wide-spreading corolla azure-blue, the petals 2-lobed or emarginate. Chile.

B.R. 28:65. R.H. 1843:300. F.S. 2:110. P.M. 9:247. R.B. 20:157. Var. **grandiflòrum**, Hort., has larger fls. F.S. 11:1160. I.H. 3:85.

AA. *Fls. red or yellow.*

B. *Petals small, protruding from the constricted mouth of the calyx.*

2. **tricolòrum**, Sweet (*T. tricolor*, Lindl.). Fig. 2583. Perennial from a fleshy or tuberous root, half-hardy, climbing: lvs. peltate, orbicular, divided into 6 oblong villous leaflets: fls. about 1 in. long, somewhat cornucopia-shaped, the calyx being the conspicuous part; main part of the calyx vermilion, the short lobes purplish, the small petals yellow. Chile. B.M. 3169. B.R. 23:1935. F.S. 4:369. P.M. 2:123.—Very choice half-hardy plant and probably the best known in this country of the tuberous-rooted kinds. Usually grown indoors. Its growth is very delicate.

3. **Járrattii**, Paxt. Much like *T. tricolorum*, but more robust, the fls. larger, more brilliant in color, the upper part of the calyx with bright spots of yellow, the two upper petals penciled with brown. Chile. P.M. 5:29.

BB. *Petals conspicuous and mostly wide-spreading.*

C. *Spur not as long as the calyx-lobes.*

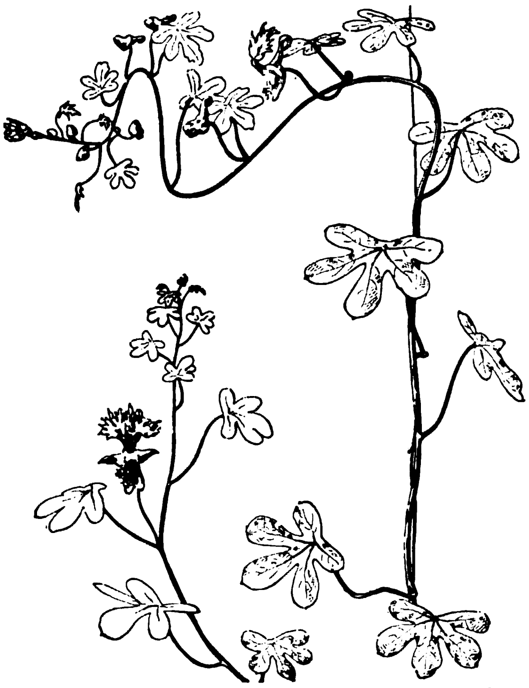
4. **brachýceras**, Hook. & Arn. A very slender climber, resembling *T. tricolorum* in habit: lvs. peltate, nearly orbicular, deeply parted into 6 or 7 oblong or obovate obtuse lobes: fls. small, on short pedicels, the calyx green and very short-spurred, the corolla with spreading yellow petals. Chile. B.M. 3851. B.R. 23:1926. F.S. 4:368. P.M. 4:55.—Half-hardy perennial.

CC. *Spur much longer than calyx-lobes.*

D. *Lvs. parted nearly or quite to the base, or distinctly compound.*

E. *Blossoms essentially red.*

5. **speciòsum**, Poepp. & Endl. Half-hardy slender climbing vine: lvs. peltate at the base, short-petioled, parted to the base into 6 obovate-oblong obtuse divisions or leaflets: pedicels very slender, red, fls. shaped much like those of *T. majus*, but smaller, vermilion-red, showy. Chile. B.M. 4323. F.S. 3:281. P.M. 14:173. Gn. 37, pp. 253, 545.—A perennial fleshy-rooted plant, hardy in England.


2584. Tropæolum peregrinum—the Canary-bird Flower (× ⅓).

2585. Tropæolum majus, the common Climbing Nasturtium. (× ⅓.)

6. **pentaphýllum**, Lam. Slender climber, the glabrous colored stems arising from a tuberous root: lvs. divided to the base into 5 oblong or obovate segments or leaflets: fls. small (about 1½ in. long), the large red spur being the conspicuous part, the lobes green, and the 2 small petals red. Argentina. B.M. 3190. B.H. 22:73.—A half-hardy species, showy because of the great number of bright small flowers.

EE. *Blossoms yellow.*

7. **polyphýllum**, Cav. Perennial, half-hardy: stem succulent, prostrate or climbing: lvs. peltate, orbicular, cut beyond the center into 7–9 narrow divisions: fls. much like *T. majus* in shape, but smaller; spur slender but rather short, the calyx-lobes triangular; petals unguiculate, yellow, wavy or emarginate, the 2 upper ones streaked with red. Chile. B.M. 4042. P.M. 10:175. F.S. 20:2066. G.C. II. 20:241. Gn. 45, p. 158.—It is a tuberous-rooted species, the stem naturally prostrate.

8. **Leichtlini**, Hort. Hybrid of *T. polyphyllum* and *T. edule* (see suppl. list), raised by Max Leichtlin, Baden-Baden. Much like *T. polyphyllum*, but the fls. of brighter color, and the lvs. larger.

DD. *Lvs. lobed, the divisions usually not extending much, if any, beyond the middle, and the sinuses usually broad.*

E. *Petals fringed.*

9. **peregrinum**, Linn. (*T. Canariénse*, Hort.). CANARY-BIRD FLOWER. Fig. 2584. Annual, tall-climbing; glabrous: lvs. peltate near the margin, cordate-orbicular, divided to about the middle into 5 lobes, which are mostly apiculate: fls. canary-yellow, odd and very irregular; spur green, hooked; 2 upper petals erect and large, obovate-clawed, much fringed: 3 lower petals small and narrow and ciliate. Colombia. B.M. 1351. B.R. 9:718.—An excellent quick-growing vine, although the fls. can scarcely be called showy.

EE. *Petals entire.*

10. **tuberòsum**, Ruiz. & Pav. Root producing a pyriform irregular tuber 2–3 in. long: stem climbing, glabrous; lvs. peltate near the base, cordate-orbicular, 5-lobed nearly or quite to the middle: fls. rather small, the calyx and long spur red, the petals yellow, small and nearly erect and little exceeding the calyx. Peru. B.M. 3714. F.S. 5:452. P.M. 5:49. R.H. 1853:341 (tubers). J.H. III. 30:385.—Plant stands some frost. In Peru, the tubers are eaten, and the plant is sometimes cult. in Europe for the tubers. It appears in the Amer. catalogues of European dealers. The tubers are usually boiled.

DDD. *Lvs. entire or only undulate.*

E. *Plant pilose.*

11. **Lobbiànum**, Veitch. Annual, climbing, hairy all over except the under parts of the lvs. and the petals: lvs. very long-stalked, peltate, nearly orbicular, undulate and with points on the margin: fls. large, long-spurred, orange-red, the two upper petals large, broad and entire, the three lower ones small and clawed and coarsely toothed and also fringed on the claws. Colombia. B.M. 4097. F.S. 2:67. P.M. 11:271. Var. **fimbriàtum**, Hort., has all the petals toothed or fringed. R.H. 1856:101.—Seldom seen in its pure state.

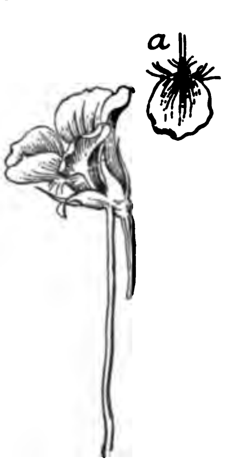
EE. *Plant glabrous.*

12. **màjus**, Linn. Figs. 2585, 2586. Strong-growing, somewhat succulent climbing annual: lvs. peltate, nearly orbicular and undulate-angled: fls. large, mostly in shades of yellow or orange, with straight spur, the 2 upper petals entire or undulate (not apiculate), the 3 lower ones narrower and fringes on the claws. Peru. B.M. 23:3375 (var. *atrosanguineum*). F.S. 12:1286 (var. *atropurpureum nanum*). P.M. 1:176 (var. *atrosanguineum*). There are double-fld. forms. G.C. II. 11:665. These appear to have been introduced into this country about 1885 or 6. There are also dwarf forms.—This species has been in cult. in Europe since 1684. It is the foundation of the common climbing Nasturtiums. Some of these garden forms are probably the offspring of hybridization with *T. Lobbianum*

2586. Tropæolum majus.

13. **minus**, Linn. Fig. 2587. Dwarf annual, not climbing, smaller in all its parts: lvs. apiculate at the ends of the veins: fls. with narrow apiculate petals. Peru. B.M. 98.—Very likely blended with *T. majus* by hybridization, in garden forms.

T. digitàtum, Karst. Climber, with root fibrous: lvs. peltate, 5–7-lobed: fls. yellow, 1 in. in diam., the spur long and red, the petals fimbriate. Venezuela.—*T. èdule*, Paxt. Climber; lvs. orbicular, with 5 or 6 narrow lfts.: fls. in shape like those of *T. majus*, but smaller, yellow. Produces tuberous edible roots. Chile. P.M. 9:127.—"*T. hederæfolia*" is offered by A. Blanc in 1901.—*T. Líndeni*, G. Wall. Beautiful climber with large, peltate, undulate-lobed lvs. that are purplish beneath and beautifully veined with white above: fls. on long pedicels, the long tube red and the calyx-lobes green. Colombia. I.H. 41:267. L. H. B.



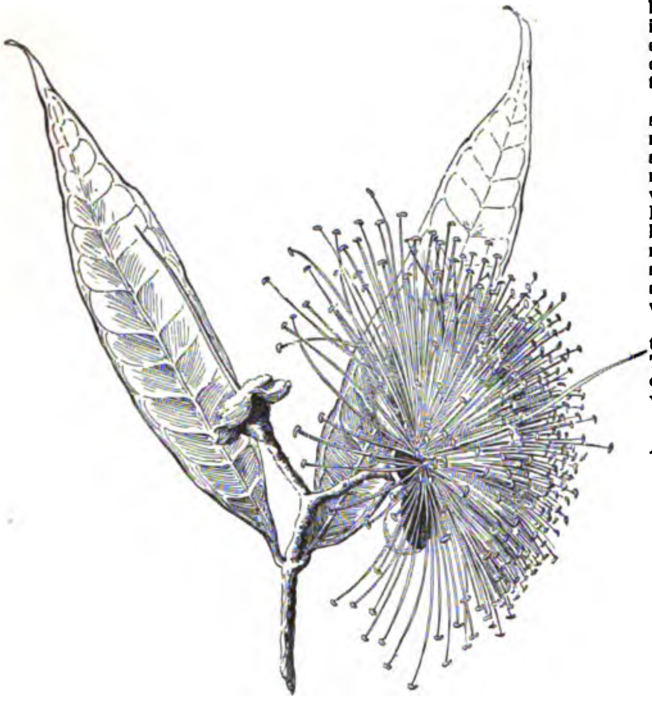
2587. Flower of Tropæolum minus (× ½).

One of the lower petals shown at *a*.

TROPICAL FRUITS. Travelers hailing from the temperate zone are generally surprised and delighted, at first, with the fruits they find in tropical markets. This is due to the fact that such things are for the most part new to them. They taste everything they see and not infrequently publish their experiences in language where praise is not stinted. Some, on the other hand, view nearly every tropical fruit with prejudice and disdain and cannot be persuaded to taste, and if eventually persuaded, only to condemn with aversion. Under such circumstances it is not to be wondered at that in some quarters tropical fruits should be held in high esteem, and in others be considered of doubtful value. That good tropical fruits do really exist cannot be disputed, although on careful examination they are found to be few in number, and some kinds far from common even in the local markets. True tropical fruits may be described as those requiring a temperature from 16° to 32° centigrade or 60° to 90° Fahr.

Among the subtropical fruits there are some which appear to thrive in the tropics as well as in their native place, but whether this is really so may be questioned. Any differences in the conditions of the fruits on reaching the ripening stage will account for difficulties often met with in preparing them for export. Such is the orange, for instance; it thrives well under tropical conditions and gives (when the class of plant grown has been well selected) fruit excellent in appearance, large in size, and possessing a fine flavor. If such fruit is grown for export, it must of necessity be packed at seasons of the year when our tropical atmosphere is charged with humidity to within 15 per cent of the saturation point, and this fact constitutes an important difficulty often overlooked by beginners in the export trade. Such difficulties can, however, be overcome by careful methods of packing and preparation, and by selecting fruit which ripens in the "dry season" when packing facilities are as good as those of a temperate climate. It is very doubtful, however, whether subtropical fruits grown in a humid climate can ever equal in their keeping qualities those produced in a lower temperature and drier climate. It has been proved that fruit can be safely transported to long distances if properly handled, but the treatment to be undergone differs considerably from that which the fruits of temperate climates require. Many tropical fruits are nothing more than what should be called wayside morsels, that is to say, although edible, they are seldom of a quality suitable for dessert, and are consumed mostly by children and wayfarers. By selection and cross-breeding these same fruits are being much improved, and strains will probably be produced which in the future will be largely sought for, as there are good indications of success in varieties which have already appeared. This is work which must be systematically adopted to sustain a regular export trade in tropical fruits, and a good start has been made from several points

The fact is that tropical fruits with but few exceptions, have until very recently been almost exclusively grown from seed, with the natural result that variety in the quality, form, size, and color of the fruit is the universal rule; and although there are seedling strains of well-marked types, buyers know that no reliance can in the main be placed upon securing fruits of uniform quality and flavor. In the case of the orange, the class of fruit raised in some districts is good as a whole, but in others the produce is of a low grade and even in the best districts inferior fruit is allowed to develop which often spoils the better samples. This is being rapidly remedied by the planting of grafted kinds. The same variation obtains with all kinds of fruit without exception. In no fruit is this feature more clearly apparent than in the mango, *Mangifera Indica*. Fig. 2589. Kinds exist which are fit for the table of a king, but at the same time there are fruits grown which the poorest beggar would refuse. The variety is almost endless, and little dependence can be placed upon quality, except those produced by trees grafted from selected kinds. These are now becoming more common, but as yet there are no large orchards planted with selected kinds, and consequently no regularity can as yet be expected in the quality and character of the fruit available for export. The mango, like the orange, easily yields to grafting; it grows rapidly and there is no reason why large quantities of this excellent fruit should not be placed upon the markets. The botanical departments of the British colonies, and elsewhere, have many selected kinds under cultivation and great effort is being made to induce the people to plant selected kinds, instead of the worthless seedlings. Mangoes have been shipped with success from the West Indies, and there would appear to be nothing of importance to prevent their being regularly placed upon the markets of Europe and America. All that is needed is to select fine strains, known both for their keeping qualities and good flavor, and to grow them in quantities that would pay. The mango, as a rule, takes many years to establish if grown from seed; but if grafted plants are cultivated, fruit is obtained in four or five years. The Julie, Divine, No. 11 Martin, Malda, Gordon, Peters, Père Louis, and Mango d'Or are varieties which are worthy of the table of the richest, and would be well suited for extensive cultivation for purposes of export. The people are slow to recognize the value of the art of budding and grafting, but education in this direction is rapidly extending under the auspices of the Departments of Agriculture and Education in the West Indies.



2588. Flower of the Rose Apple or Jambos, one of the minor Tropical Fruits. Natural size. (See p. 557.)

Many fruits practically unknown in northern latitudes are readily available here in small quantities, but insufficient to maintain a paying export trade. If they were grown in larger quantity and in uniform quality, there is no serious obstacle to their being regularly placed upon the northern market. The system of transportation now in use is not thoroughly efficient, but would soon adapt itself to the circumstances of a profitable trade.

The success of the banana as an export fruit has long been a recognized fact; and the trade is yearly increasing. In this case the propagation is carried on by suckers, and there is no variation in the quality of the produce; the market always gets the same quality, hence the success.

Among the best of all tropical fruits is the Mangosteen, *Garcinia Mangostana*, native of the Straits Settlements. This has been fruited in Jamaica and Trinidad, and the fruit has been sent in good order to the English market. It is, however, slow-growing, and as yet only very few trees of it are in existence in the West Indies. It has grown well in Trinidad, and has produced excellent crops of fruit of the finest flavor and there can be no doubt that many of the islands in the West Indies are quite capable of growing this fruit to perfection; and there is no doubt that it could be carried to market without serious loss in transit.

Writings upon tropical fruits are much scattered and there is as yet no book dealing solely with the subject. The most important tropical fruits are detailed in the order of their local value in the following list (see the various entries in this Cyclopedia):

TROPICAL FRUITS OF THE WEST INDIES AND CENTRAL AMERICA:

1. Banana, Musa species. Figs. 187–8.
2. Cocoanut, *Cocos nucifera*. Figs. 506–7, 1497.
3. Pineapple, *Ananas sativus*. Figs. 83, 1810–11.
4. Mango, *Mangifera Indica*. Figs. 2589, 1360–1.
5. Mangosteen, *Garcinia Mangostana*. Fig. 893.
6. Sapodilla, *Achras Sapota*. Fig. 2249.
7. Pear (Alligator Pear), *Persea gratissima*. Fig. 1724.
8. Sugar Apple, *Anona squamosa*. Fig. 94.
9. Custard Apple, *Anona reticulata*.
10. Sour-sop, *Anona muricata*.
11. Governor's Plum, *Flacourtia Ramontchi*. P. 589.
12. Akee, *Cupania sapida*.
13. Cashew, *Anacardium occidentale*. P. 60.
14. Guava, *Psidium Guajava*. Fig. 2008.
15. Pomme Cythère, *Spondias dulcis*.
16. Granadilla, *Passiflora macrocarpa*.
17. Water Lemon, *Passiflora laurifolia*.
18. Star Apple, *Chrysophyllum Cainito*. Fig. 469.
19. Genip, *Melicocca bijuga*. Fig. 1388.

Of this list probably not more than half the number are cultivated in selected varieties, and some are mere wayside fruits, as the guava, genip and cashew. The banana, cocoanut and pineapple are largely exported. The mango is capable of being grown to any extent for export to temperate climates. The mangosteen is a fruit the cultivation of which should be largely extended. The sapodilla if grown from the finest selected varieties is one of the choicest of tropical fruits. It is tender when ripe but carries well when "full," a West-Indian term for maturity. The pear (Persea) is a fruit which also carries well when mature. It is what should be called a salad fruit and is eaten with pepper and salt. In the East it is often served with sherry and sugar as fruit at dessert.

The anonas, Nos. 8, 9 and 10, are good additions to the dessert when well grown from selected kinds. The last, or sour-sop, is particularly well suited for flavoring ices, it being considered by many as the best of all the fruit flavors for this purpose. It could be easily exported in ice. The akee might be exported if preserved. The part used is the large arillus attached to the seed, and it is served as a relish with meat dishes. The governor's plum is a fruit the size of a green-gage and makes fine jellies. The cashew is useful when preserved, but is too tender for export. The large seeds, roasted and bottled for preservation, form one of the best table nuts known. The guava can only be exported in the form of the well-known guava jelly. When a good variety is to hand the Pomme Cythère is an excellent and well-flavored table fruit. The granadilla makes excellent ices, and the water lemon is much used as dessert, having the appearance and flavor of a huge ripe gooseberry, though generally somewhat sweeter. *Melicocca bijuga*, or the genip, is a children's fruit, and is seldom seen at table. Like all similar fruits there has practically been no selection, and a large amount of variation appears. This is very prominent in the genip. Some are very acid, while others are deliciously sweet. This variation, as shown in seedlings, is fully sufficient to account for the diverse opinions as to the qualities of tropical fruits.

The citrous tribes are, of course, sub-tropical fruits, but it is possible to grow them to great perfection in the tropics. When grown upon the sour orange stock, the trees are capable of reaching a large size, and will afford regular crops. An excellent start has been made in many West Indian islands in the cultivation of grafted plants of the best kinds.

Trees in the tropics usually have their regular season of fruiting, but many trees, such as the mango and the orange, produce fruit out of season, or in the coolest season of the year. Trees which fruit at such a season are generally the most inferior kinds.

Most visitors to the tropics choose this season for making their tour, and in consequence never have the opportunity of seeing or tasting the best qualities of the fruit produced, and only get inferior kinds, which the regular resident would not trouble to eat. When a mango is described as "all tow and turpentine," the writers were writing truly of the ordinary "out of season" mango, but all-the-year-round residents know that these kinds are as different from the selected varieties as is the quince from a jargonelle or a pear or a crab apple from a Ribston pippin. J. H. Hart.

Another View of Tropical Fruits. — The fruits most grown for export from the West Indies are bananas, oranges, grape fruit or pomelo, pineapples and cocoanuts. Others that are prized, but not exported to any extent, are mangoes, grapes, star-apples, naseberry or sapodilla, avocado pear, granadilla, cherimoya, sweet sop and mangosteen.

Banana.—There are between 20 and 30 different varieties of banana, and about half as many of the plantain, which is the form of banana used as a vegetable. The enormous export of over 8,000,000 bunches of bananas annually from Jamaica is almost entirely of one particular variety, which goes under various names,—"Jamaica," "Martinique," "Gros Michel," etc. A small quantity of a red-skinned variety is occasionally exported. It is prized rather for its color and effectiveness in a dish of fruit than for its quality. There are others, such as "Lady's Finger," which are superior in flavor to the Jamaica, and are destined to obtain in time special prices in the markets. These superior varieties have mostly been collected by the Royal Gardens, Kew, from India, Java, Straits Settlements, etc., and have been sent out from time to time to the Botanic Gardens of the West Indies.

The soil most suitable for banana culture is a deep loam with a large proportion of humus. Good drainage is essential. Bananas grow well under irrigation, but the application of the water must be carefully watched. The only disease that is known is a species of Marasmius, a fungus which attacks the petiole of the leaf. It has not done much harm, and in fact has not attracted any notice except in Trinidad. Insects do not interfere with plant or fruit. Nematode worms are known in other countries to have caused great destruction, but no cases are reported from any part of tropical America.

Citrous Fruits (more properly sub-tropical).—Until a few years ago no attention was paid to the cultivation of any of the citrous fruits: they simply grew wild,—seeds were dropped by birds, and wherever the soil was suitable trees sprung up. Naturally many hybrids and inferior kinds exist, but the great mass of the trees have come true, and the fruit is of excellent quality. Since Florida has suffered so much in its orange-groves, cultivation in the West Indies has become general, and all the best kinds of Citrus have been imported from Florida, California and England. In Jamaica the navel orange was introduced direct from Bahia many years ago, and there is good evidence that it occurs spontaneously in the island at the most favorable elevation for the orange,—about 2,300 feet. A natural hybrid between the sweet orange and the tangierine is also known in the same district. The general excellence of the orange in Jamaica is partly due to the large numbers of grafted St. Michaels that were distributed from the Botanic Gardens at Castleton. A limestone soil seems to suit the orange best. At low elevations both the orange and the grape fruit are rather sweet, but this fault gradually disappears and the flavor improves the higher the elevation,—the limit in Jamaica being somewhere about 4,000 feet for the orange, and 3,000 feet for the grape fruit. The diseases and insect pests that attack the citrous tribe in other countries are known in the West Indies, and the roots of trees are also attacked by the grub of a beetle, a species of Præpodes. Trees that have grown wild are not subject to disease or insect pests.

2589. Fruits of the Mango, Mangifera Indica (× 1-5).
See also ***Mangifera***, Vol. II.

Pineapples.—Pineapples are indigenous in tropical America, and although it is scarcely possible to say whether they are truly native in any of the West Indian islands, they are spoken of as being grown not very long after the discovery by Columbus. Joseph Acosta, in his "Naturall and Morall Historie of the East and West Indies" (London, 1604), says: "The first Spaniards named many things at the Indies with such Spanish names as they did most resemble, as Pines . . . although they be very different fruits to those which are so-called in Spaine . . . The best [pines] are those of the Islands of Barlovente [Greater Antilles]." The Botanic Gardens in Jamaica are making experiments in crossing different varieties. The Ripley is the general favorite in Jamaica for its exqnisite flavor, but the Smooth Cayenne is being cultivated largely for export, as its finer appearance ensures a higher price in the markets. Mealy bug attacks the cultivated pine-apple, and blight and tangle-foot occur as in Florida, but in suitable situations it grows wild without any cultivation quite free from disease.

Cocoanuts.—There is a large export of cocoanuts in the shell from the W. Indies, and in Jamaica there is a factory for making cocoanut oil. The palms are subject in some districts to a disease which attacks the terminal bud. So far as can be judged, it is of a bacterial nature, and probably infection is caused by beetles and other insects. In the West Indies cocoanuts flourish even in the interior of the islands and at a considerable elevation—2,000 feet. They require an abundance of water at their roots.

Mangoes were introduced into the West Indies towards the end of the eighteenth century, and to-day they are the commonest trees—the reason being that the seeds germinate readily and at once take root in almost any soil. The trees will grow even at elevations of 5,000 feet, but they do not bear fruit above 3,500 feet, nor do they bear at all in wet districts. There are numerous varieties, most of them being somewhat fibrous, even the esteemed "No. 11" containing some thread-like fiber. In the year 1869 several of the best grafted varieties of India were imported from Bombay for the Botanic Gardens of Jamaica; these are of superior excellence and without fiber. The seedlings of these Bombay mangoes do not come true, but the majority of them bear good fruit. Grafted plants are distributed from the various botanic gardens of the West Indies. Experiments in budding are being carried on with a view to bud the numerous inferior kinds. Even the coarse mangoes which are worthless as fruit, if picked before ripe, make excellent tarts, preserves, pickles, etc., and there is a wide field for enterprise in utilizing such fruit in various ways.

The pineapple, cashew, ginep, naseberry or sapodilla, sweet sop, sour sop, custard apple, avocado pear, cherimoya, Spanish plum (Spondias), Barbados cherry, papaw, Fig. 2590, cocoa-plum, star apple, granadilla, sweet cup, pomme d'or, guava, mammee and mammee sapota are all natives of tropical or subtropical America or the West Indies, or are indigenous on both the mainland and some of the islands.

2590. Papaw tree—Carica Papaya. A tropical fruit of secondary importance. (See also p. 246.)

This picture shows a specimen grown in the open in southern Florida; Fig. 363 shows one grown in a northern greenhouse.

The banana, citrous fruits, cocoanut, mangosteen, carambola, bilimbi, Nilgiri blackberry, tamarind, pomegranate, grape, akee, bread-fruit, and jack-fruit are introduced from other countries.

The akee, bread-fruit, jack-fruit, cho-cho (*Sechium edule*, Fig. 2281), ochra and avocado pear are fruits used as vegetables.

Great improvements have lately been made in the mode of packing fruits for export. The Government of Jamaica is about to appoint inspectors of fruit for export, who will stamp all packages that pass as well-graded, well-packed, etc., with the Government mark. It will be optional for exporters to take advantage of such inspection.

The Imperial Department of Agriculture in the Lesser Antilles, and the Botanic Gardens of Jamaica, Trinidad, and British Guiana are devoting a considerable amount of attention to fruit with gratifying results.

The inauguration in January, 1901, of a new line of steamers, with a subsidy of $200,000 annually, specially built for the fruit trade, and sailing direct from Jamaica to England, has already had a great effect in increasing the area under cultivation. This is only the first step in a regular and systematic export of fruit from the West Indies to Europe, and the development of the trade to an enormous extent is confidently anticipated.

WM. FAWCETT.

Botany of Tropical Fruits. All the tropical fruits mentioned above are described in this work at their proper places, with the exception of some of the following:

Barbadoes Cherry is *Malpighia glabra*, which see.
Nilgiri Blackberry is *Rubus racemosus*.
Ochra is another spelling for *Okra*.
Pomme Cythère is *Spondias dulcis*, described below.
Pomme d'Or is *Passiflora laurifolia*.
Spanish Plum. Consult *Spondias purpurea*, below.
Sweet Cup is *Passiflora edulis* and *P. maliformis*.

The genus **Spóndias** of the family *Anacardiàceæ* takes its name from an old Greek word used by Theophrastus for some kind of plum. It contains about 8 species of tropical trees with alternate odd-pinnate lvs., numerous opposite lfts., minute whitish fls. and yellow fruits as large as common plums. Botanically the fruit is a fleshy drupe with a 1-5-loculed bony endocarp. The genus is distinguished by the following characters: ovary 3-5-loculed; ovule pendulous: lvs. pinnate: fls. polygamous; stamens 8-10: styles 4-5, free at apex. The following are widely cult. in the tropics.

A. *Locules of the echinate nut distant, connected only by the common base.*

dúlcis, Forst. POMME CYTHERE. SWEET OTAHEITE APPLE. FRUIT DE CYTHERE. HEVI. WI FRUIT, in Tahite. Height 50 ft.: lfts. 11-13, oval-oblong, acuminate, serrate: fr. golden yellow, tastes something like a pineapple. Society Islands.

AA. *Locules of the smoothish nut contiguous and more or less adnate.*

B. *Racemes panicled, often exceeding the lvs.: fls. yellowish white.*

lùtea, Linn., (*S. Mómbin*, Jacq., not Linn.). GOLDEN APPLE. JAMAICA PLUM. Tall tree: lfts. 7-17, ovate-lanceolate or lanceolate, subentire or serrulate: panicle ½-1 ft. long: fr. ovoid, 2 in. long, yellow. Cosmopolitan in tropics.

BB. *Racemes unbranched, few-fld., much shorter than lvs.: fls. purplish.*

purpùrea, Linn. (*S. Mómbin*, Linn., not Jacq.). SPANISH PLUM. Low tree: lvs. deciduous: lfts. 16-21, elliptic-oblong, bluntish, usually serrate: fr. obovoid, 1 in. long, yellow or tinged purple. American Tropics.

TRÓXIMON (Greek, *edible;* which does not apply). *Compósitæ.* A genus of 15 species of mostly perennial, nearly stemless herbs native of North America except possibly 2 species which are South American. The species are generally low-growing hardy plants with clusters of sessile, radical leaves and simple scapes bearing a head of yellow or purple flowers in summer.

cuspidàtum, Pursh. Root thick: lvs. entire, linear-lanceolate, thickish, 4–10 in. long: scape about 1 ft. high: fls. yellow: akene not beaked. Prairies of Ill. and Wis. to Dakota. B.B. 3:278.—Cultivation easy in any good border. Not unattractive. It has rather larg dandelion-like heads of flowers in late summer. Offered by collectors.

F. W. Barclay.

TRUE LOVE. *Paris quadrifolia.*

TRUFFLES. See Vol. II, p. 1045.

TRUMPET CREEPER. *Tecoma*, especially *T. radicans.*

TRUMPET FLOWER. Consult *Bignonia.*

TRUMPET HONEYSUCKLE. *Lonicera sempervirens.*

TRUMPET VINE. *Tecoma radicans.*

TSÙGA (its Japanese name). *Coniferæ.* Hemlock. Hemlock Spruce. Ornamental evergreen trees of pyramidal habit, with spreading, irregularly whorled, much ramified branches clothed with small, linear, usually 2-ranked leaves and small cones which are usually freely produced. The cones are only about 1 in. long except in one species, which has cones two or three times as large. *T Canadensis* is quite hardy north and the Japanese species and *T. Caroliniana* have proved hardy as far north as Ontario. *T. Hookeriana* is almost as hardy. *T. Mertensiana* and *T. Brunoniana* are more tender. There are probably no more beautiful hardy conifers than the Hemlocks, and they must be ranked among the most ornamental and useful trees for park planting. They do not have the stiff, formal appearance of many of the conifers, but are graceful and stately at the same time. *T. Mertensiana* is the most vigorous species and is more graceful than the Canadian Hemlock, but tenderer. *T. Hookeriana* is noticeable for its light bluish green foliage and the more narrow pyramidal habit. The Japanese species have very handsome dark green glossy foliage, but are of slow growth. *T. Canadensis* bears pruning well and is well suited for tall hedges (see Gng. 2:289). The other species will probably bear pruning well. The Hemlocks are not very particular as to the soil, provided it contains a sufficient amount of constant moisture. Tsugas are not difficult to transplant. Prop. by seeds sown in spring and by grafting on *T. Canadensis.* The varieties and the Japanese species are also raised from cuttings. See also *Conifers, Abies* and *Picea* for cultivation.

The genus contains 7 species, natives of N. America, E. Asia and the Himalayas. Tsuga is closely allied to Abies and Picea and differs little in the structure of the fls.; the cones are very similar to those of the larch, but the lvs., though much like those of Abies in their outward appearance, are very different in their internal structure from all allied genera, since they have a solitary resin-duct situated in the middle of the leaf below the fibro-vascular bundle. The light, soft, brittle and coarse-grained wood is not durable and not much valued except that of *T. Mertensiana*, which is harder and more durable, and that of *T. Sieboldi*, which is esteemed in Japan for its durability. The bark is rich in tannin and that of *T. Canadensis* is extensively used for tanning leather.

Tsuga Canadensis should be called "Hemlock Spruce," but in common speech it is usually alluded to as "Hemlock." The "Hemlock" of the ancients is a poisonous umbelliferous herb described in this work as *Conium maculatum.*

INDEX.

albo-spica, 4.
Araragi, 1.
argentea, 6.
Canadensis, 4.
Caroliniana, 3.
compacta, 4.
diversifolia, 2.
globosa, 4.
globularis, 4.
gracilis, 4.
heterophylla, 5.
Hookeriana, 6.
Mertensiana, 5, 6.
microphylla, 4.
nana, 1, 4.
parvifolia, 4.
Pattoniana, 6.
pendula, 4.
Rœzlii, 6.
Sargenti, 4.
Sargentiana, 4.
Sieboldi, 1.

A. *Lvs. with 2 white lines beneath, grooved above, much flattened, distinctly 2-ranked: cones ½-1½ in. long.*
  B. *Margin of lvs. entire: apex of lvs. usually emarginate, sometimes obtuse.*
    C. *Scales of cones suborbicular.*
      D. *Branchlets yellowish brown, glabrous* .... 1. **Sieboldi**
      DD. *Branchlets reddish brown, pubescent* .... 2. **diversifolia**
    CC. *Scales of cones oblong: lvs. often obtuse* .... 3. **Caroliniana**
  BB. *Margin of lvs. finely denticulate, at least towards the apex: apex of lvs. obtuse or acutish.*
    C. *Cones peduncled: scales almost orbicular, glabrous.* 4. **Canadensis**
    CC. *Cones sessile: scales oval, slightly puberulous outside.* 5. **Mertensiana**
AA. *Lvs. stomatiferous on both sides, flat or convex above, spirally arranged: cones 2–3 in. long (Hesperopeuce)* .... 6. **Hookeriana**

2591. A spray of Hemlock Spruce (× ⅔).

1. **Sièboldi**, Carr. (*T. Araràgi*, Koehne). Tree, attaining 90 ft., with spreading slender branches: branchlets pale yellowish brown, somewhat glossy, with reddish leaf-cushions: lvs. linear, usually broadest at the apex, emarginate, grooved and glossy dark green above, with 2 whitish lines beneath, ¼–¾ in. long: cone ovate, 1–1¼ in. long, the peduncle exceeding the bud-scales: bracts bifid. Japan. G.F. 10:492.—Var. **nàna**, Endl. Dwarf bushy form, with short branchlets and very short crowded leaves.

2. **diversifòlia**, Mast. (*Àbies diversifòlia*, Maxim.). Tree, very similar to the preceding, chiefly distinguished by the reddish brown pubescent branches: lvs. linear, emarginate or obtuse, shorter and narrower, broadest at the middle or toward the base: cone smaller, ½–¾ in. long: peduncle not exceeding the bud-scales; bracts truncate, crenulate, not or slightly bifid. Japan. G.F. 6:495; 10:493.

3. **Caroliniàna**, Engelm. Carolina Hemlock. Tree, attaining 70 ft., of more compact habit and with darker green foliage than the following: young branchlets light reddish brown, finely pubescent or almost glabrous: lvs. linear, obtuse or emarginate, dark green

and glossy above, with 2 whitish lines beneath, ⅛–¾ in. long: cones oblong, 1–1⅛ in. long, peduncled; scales oblong. Va. to S. C. S.S. 10:604. G.C. II. 26:780. G.F. 2:269.—More graceful than the next.

4. **Canadénsis**, Carr. (*Àbies Canadénsis*, Michx.). COMMON HEMLOCK. Fig. 2591. Tree, attaining 70 and occasionally 100 ft.: young branchlets yellowish brown, pubescent: lvs. linear, obtuse or acutish, dark green and obscurely grooved above, with 2 whitish lines beneath, ¼–⅜ in. long: cones ovoid, ½–¾ in. long, peduncled; scales almost orbicular. New Brunswick and Wis., south to Ala. S.S. 10:603.—The Hemlock Spruce yields the lumber most commonly used in the East for framing and clapboarding of buildings. It is not used for finishing lumber. A number of garden forms have been raised; the following are the most important: Var. **álbo-spica**, Nichols. Tips of the young branchlets creamy white. Var. **compácta**, Sénécl. (var. *compácta nàna*, Beissn.). Dwarf conical pyramid with numerous short branchlets clothed with small leaves. Var. **globòsa**, Beissn. (var. *globulàris erécta*, Kunkler). Dense, globose, much branched form with numerous upright branches nodding at the ends. Var. **grácilis**, Gord. (var. *microphýlla*, Hort.). Slow-growing form with slender sparingly ramified branches, spreading and more or less drooping at the ends: lvs. very small, about ¼ in. long. Var. **nàna**, Carr. Dwarf and depressed form with spreading branches and short branchlets. Var. **parvifòlia**, Veitch. Lvs. very small, ¼ in. long or shorter: branchlets closely set and numerous. Var. **péndula**, Parsons (var. *Sárgenti péndula*, Hort., var. *Sargentiàna*, Kent.). Flat-topped form with spreading branches and drooping branchlets. Gn. 32, p. 363; 39, p. 81. M.D.G. 1900:367, 368, 491. Very distinct and desirable form.

5. **Mertensiàna**, Carr. (*T. heterophýlla*, Sarg. *T. Albertiàna*, Sénécl.). Tree, attaining 200 ft., with short slender usually pendulous branches forming a rather narrow pyramidal head in older, but rather broad in young trees: young branchlets pale yellowish brown, pubescent: lvs. linear, obtuse or acutish, distinctly grooved and dark green above, with 2 white lines below, ½–¾ in. long: cones oblong-ovoid, sessile, ¾–1 in. long; scales oval, slightly puberulous outside. Alaska to Calif., west to Mont. S.S. 10:605. G.C. III. 12:11.

6. **Hookeriàna**, Carr. (*T. Mertensiàna*, Sarg., not Carr. *T. Pattoniàna*, Sénécl. *T. Hoókeri*, Carr. *Àbies Williamsoni*, Newb. *Hesperopeùce Pattoniàna*, Lemm.). Tree, attaining 100 and occasionally 150 ft., with slender pendent branches usually forming an open pyramid: young branchlets light reddish brown, pubescent, usually short and upright: lvs. spirally arranged around the branches, linear, usually curved, acutish, mostly rounded or keeled, rarely slightly grooved above, light bluish green or pale bluish white, with whitish lines on both sides, ½–1 in. long: cones cylindric-oblong, usually violet-purple before maturity, brown when ripe, 2–3 in. long: scales obovate, puberulous outside. Brit. Col. to Calif., west to Mont. S.S. 10:606. G.C. III. 12:10; 13:659; 21:150, 151. G.F. 4:380; 10: 6, 7. R.H. 1870, p. 21. Var. **argéntea**, Beissn. Foliage bluish white.

T. Brunoniàna, Carr. (T. dumosa, Sarg.). Tree, attaining 120 ft.: lvs. narrowly linear, acutish, ½–1¼ in. long, with silvery white lines beneath: cone 1 in. long. Himal. G.C. II. 26:73, 501.—*T. Doúglasii*, Carr.=Pseudotsuga Douglasii.

ALFRED REHDER.

TUBEROSE. Consult *Polianthes*.

TUCKER, LUTHER (Plate XLI), born at Brandon, Vt., May 7, 1802, was the founder of "The Horticulturist" and the proprietor of that valuable and unique magazine during the period of its greatest glory—from July, 1846, until the autumn of 1852. The statement, on page 501 of this Cyclopedia, that the younger Downing "founded 'The Horticulturist,'" is inexact, he having been the salaried editor, while the enterprise was Tucker's alone. To Downing, nevertheless, belongs all the credit for the great and distinguished interest and value of the magazine, as he conducted it according to his own ideas, with which the proprietor never interfered, the latter having indeed enough to do in putting it before the public with enterprise and vigor. It was issued simultaneously in Albany, Boston, New York and Philadelphia, with 22 special agencies at other points, including what was then the distant western town of Cleveland, Ohio, as well as Hamilton and Cobourg in "Canada West." Luther Tucker also founded, at Rochester, N. Y., October 27, 1826, the first daily paper published west of New York, "The Advertiser," which is still, under a slightly extended name, an influential journal; also at Rochester, January 1, 1831, "The Genesee Farmer," a weekly, the first agricultural periodical in the world written directly from the standpoint of practical experience. It has undergone some changes in name, as its scope extended far beyond the Genesee valley, and has been published in Albany since January, 1840, being now called "The Country Gentleman." This is one of the ten American agricultural periodicals that were started before 1850 and outlived the nineteenth century, the others being these: "Maine (Kennebec) Farmer," 1839; "American (Boston) Cultivator," 1839, "Southern Planter," 1840; "Massachusetts Plowman," 1841; "Prairie Farmer," 1841; "American Agriculturist," 1842; "Southern Cultivator," 1843; "Indiana Farmer," 1845; "Rural World," 1848; "Ohio Farmer," 1848. It is now (1901) published by a son and a grandson of the founder. Mr. Tucker was the descendant of a long line of landowners. The first of the name of whom anything is known was granted arms, and it is believed estates, by William the Conqueror, and his descendants in the direct line down to the subject of this note were uniformly, both in England and in the American colonies and states, country gentlemen and cultivators of the soil. Strong rural tastes came to Luther Tucker as an inheritance, and his conception of a happy and well-spent life was a life as much as possible in the open air and devoted to the advancement of agriculture and its allied arts and the amelioration and refinement of the condition of all classes of country residents, from the proprietor to the humblest laborer. It was, therefore, natural that he should be deeply interested in the New York State Agricultural Society, which he found at a low ebb on his coming to Albany, and of which, only a year later, he was the chief reorganizer, getting on foot the long series of annual fairs beginning in 1841 and still continued. He served the society without any compensation or even reimbursement for his own expenses, for eleven years. The society then presented him with a handsome table service of silver, and adopted resolutions (afterwards reënacted at the time of his death) to the effect that the great success of the early fairs, paving the way for those that followed, was chiefly due to his unremitting exertions. He died at Albany, after a short illness, January 26, 1873.

GILBERT M. TUCKER.

TULIP. See *Tulipa*.

TÙLIPA (originally from Persian *toliban*, turban; which the inverted flower resembles). *Liliàceæ*. TULIP. Plate XLV. Bulb tunicated, the outer tunic often hairy or woolly on the inner face: stem 3–30 in. high, usually 1-fld., rarely 2- 3- or 4-fld.: lvs. linear or broad: fls. erect, rarely nodding, showy; perianth deciduous, campanulate or slightly funnel-shaped; segments distinct, often spotted or blotched at base, without pitted nectaries; stamens 6, hypogynous, shorter than perianth-segments; filaments longer or shorter than anthers, attenuate or filiform; anthers dehiscing laterally: ovary sometimes narrowed at collar, rarely into a distinct style; stigmas adnate: seeds numerous, flat. Differs from Fritillaria in the absence of nectariferous pits and usually erect (never pendulous) fls., and from Erythronium in its erect, broader perianth-segments, erect fls., and usually 1-fld. stems. Native of Oriental countries, Siberia, Asia Minor, China and Japan, and naturalized in the Mediterranean countries of Europe. The genus now includes 83 species, only about half of which are in cultivation at present. The latest monograph is Baker, in "Gardeners Chronicle," for 1883. Solms-Laubach is the leading authority on the history of the garden Tulips (see his "Weizen und Tulpe, und deren Geschichte," Leipzig, 1899). See Burbridge, Gn. Sept. 22, 1900.

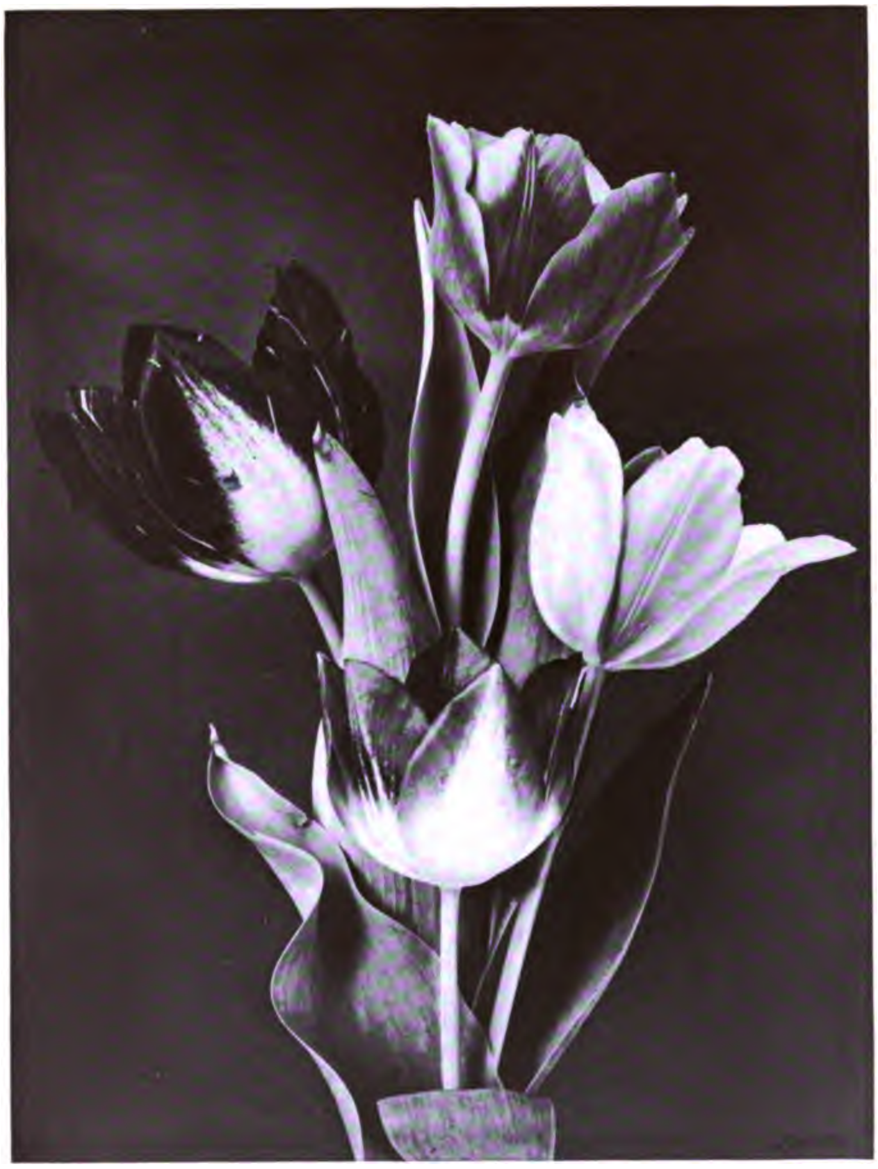


Plate XLV. The Modern Garden Tulip

Cultivation.—The production of large, perfect flowers depends entirely upon a large supply of fibrous roots. Size of bulbs is not nearly so important: a large bulb cannot offset a deficiency of roots.

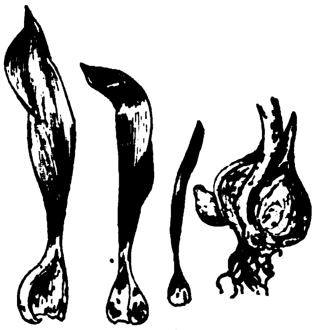
For outdoor cultivation the bulbs should be set in September to November in New York. They should be planted before hard freezing weather comes. The soil should be a sandy loam, well worked to a depth of at least 12 inches, and enriched with leaf-mold and well-rotted cow manure. Fresh manure of any kind should never be used near bulbs of any sort. On heavier soils Tulips can be successfully raised if extra care is given to insure perfect drainage. Drainage is important under all conditions. The bulbs will never prove satisfactory in low, wet situations, and if there is danger from standing water it is best to raise the beds several inches above the surrounding ground.

Plant the bulbs 4 inches deep (to the bottom of the bulbs) and from 4 to 5 inches apart, depending upon the size of the plants. A handful of sand under each bulb is recommended in soils that do not already possess a preponderance of this material. The cushion of sand allows the water to drain away rapidly and at the same time insures the presence of an easily penetrable medium for the young roots. Care should be exercised to place all the bulbs at the same depth, as otherwise they will not all bloom at the same time. When the ground begins to freeze, cover the beds to a depth of several inches with leaves, dry forest litter or other light material. After danger of heavy frosts is past in spring the beds should be uncovered, and if the work of preparation and planting has been well done the Tulips will require little or no further care. In England many of the beds of choice and delicate varieties of Tulips are protected when in flower from heavy rains and hot sun by means of light cloth screens, and are thus kept in good condition for some time.

For pot culture, a mixture of fine garden loam, two parts to one of well-rotted manure (cow manure composted for two years is best), mixed with enough clean sand to make the mass easily friable, is most suitable. If no loam is obtainable and a heavier garden soil must be used, one part of the latter will be sufficient, in which case the addition of an equal proportion of leaf-mold will be advantageous. From 3 to 5 bulbs, according to size, to a 5-inch pot are effective. Fill the pots lightly and press the bulbs into the soil, thus bringing the base in close contact with the soil particles. Cover the bulbs to the tip and press the soil firmly all around. Water once freely and cover the pots entirely with soil, leaves or litter, so that they will be out of reach of frost, or place them in a dark cold (not freezing) cellar or room until the bulbs have become well rooted, which under ordinary conditions will require five or six weeks. When the pots have become well filled with roots—the more the better—they are ready to be brought into the house. For the first few days at least the temperature should be moderate and even, and the atmosphere not too dry. Water freely but not to excess. Some of the varieties—especially the white thin-petaled ones—are said to resent over-watering very quickly. If raised in living rooms greater care is necessary, as the atmosphere of a living room is drier than that of a greenhouse. On cold nights the plants should be removed from exposed places where they are liable to freeze, and when the flowers appear they should not be allowed to stand in the direct rays of the sun shining through a window. Many of the handsomest flowers are thus easily burned and wilted. Practically all of the early single varieties are adapted to pot culture, especially the Duc van Thols when well rooted; otherwise they are extremely unsatisfactory. For a succession, pot every week or 10 days from September to December or pot early and bring into the house at fortnightly intervals. In potting avoid caking soil beneath the bulbs.

Many of the early single varieties are adapted to water culture. For this purpose use ordinary "hyacinth" glasses and select only well-formed, solid, perfect bulbs of fair size. Use rain water, and put in a little charcoal to keep it pure. The bulbs must be placed so that the base is just in contact with the water—not immersed in it. Place them in a dark closet for 10 days or a fortnight until the bulbs have become well rooted, then give them plenty of light and air. Avoid gaslight as much as possible, and in cold weather protect them from freezing.

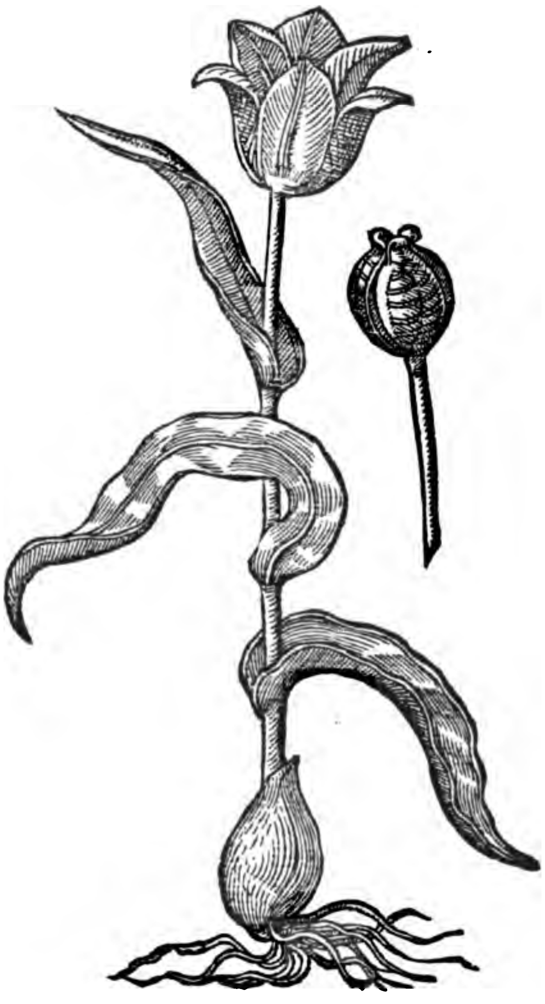
Propagation.—Tulips may be increased by the side offsets, but these are not as constant as new bulbs produced within the outer tunics by means of cutting the old bulbs. Fig. 2592 shows a section of a bulb with new inner bulb and outer offset in place. The new bulb is completely inclosed in a sac which afterwards becomes the outer dry, membranous tunic. The pubescence, if any, may be found on the inside of this sac even in the earliest stages of growth. The new bulb is attached to the base of the flower-stem, immediately above the root-crown from which the former proceeds directly upward. Each new bulb-tunic (including the outer sac) is provided with a growing tip, which often extends above ground into a leaf, each one coming up within the other. Fig. 2592 shows the separated leafy bulb-scales, and indicates the homology of tunics and leaves. Sports among the offsets are at present mainly depended upon for the production of new varieties. These have been found susceptible to the "breaking" process, though perhaps slower to respond than the seedlings. Seed production is now practiced only in exceptional cases. The production of hybridized varieties by crossing the old forms with some of the newly introduced species is very likely a probability of the near future.



2592. Three leafy bulb-scales from young bulb, exhibiting the homology of leaves and bulb-scales (× ⅓). At the right an old Tulip bulb, showing formation of new bulb within the old, and flower stem attached directly to root-crown.

The Original Tulip.—The origin of the garden Tulip seems to be lost beyond recovery. It is often said that our garden Tulips are derived from *Tulipa Gesneriana*, but this is an explanation which does not explain. It merely means that in 1753, the year which is usually but arbitrarily taken as the beginning of systematic botany, Linnæus grouped all the garden Tulips he knew under the name of *Tulipa Gesneriana*. But the Tulips of that day had been cultivated for two centuries by Europeans, and previously for an indefinite period by the Turks, from whom, of course, we have no exact records. Fig. 2593. One might study wild Tulips in their native places and compare them with descriptions without being certain of the original form which the Turks brought from the wild, simply because of the lack of records at the beginning. It is necessary to have some scientific name for the garden Tulips. The most one dare say is that the garden Tulips are chiefly referable to *T. Gesneriana* and *T. suaveolens*, with the distinct understanding that these names do not represent an original wild stock.

Tulipa suaveolens requires explanation. This name, which dates from 1797, stands for a kind of Tulip discovered growing wild in southern Europe long before that date. There is no proof that it was native; the probability is that it had escaped from gardens and run wild. In 1799, it was distinguished from the other Tulips then known by the fragrance of the flowers, the earliness of bloom, slightly greater size and pubescent scape. From the early records it appears that there were fragrant, early-blooming flowers among the first Tulips received from Turkey. This is one of the main reasons for believing that *T. suaveolens* is not native to southern Europe. At all events it is clear that *T. suaveolens* has played an important part in the evolution of the garden Tulip, the Duc van Thol class being generally credited to this source. The distinctions between *T. suaveolens* and *T. Gesneriana* given below are those of Baker, but they do not hold at the present day. It is impossible to refer any given variety with satisfaction to either type. Some writers have said that the leaves of *T. suaveolens* are shorter and broader than those of *T. Gesneriana*. This character also fails. All grades of pubescence are present. Some pubescent plants have long leaves and odorless flowers. Others have short, glabrous leaves and fragrant flowers.



2593. A sixteenth-century Tulip.

From the work of Clusius published in 1576. One of the oldest pictures of Tulips. Same size as original plate.

For practical purposes it may be said that most of the common garden Tulips, at least the late-flowering ones, are *T. Gesneriana*, while many of the early-flowering kinds, e.g., the Duc van Thol class, are supposed to be derived from *T. suaveolens*. It is impossible to press much nearer the truth, as botany is not an exact science and the prototypes of the old garden favorites cannot be known completely and precisely.

Early History. — The first Tulip seeds planted by Europeans were sent or brought to Vienna in 1554 by Busbequius, the Austrian ambassador before the Sultan of Turkey. Busbequius reported that he first saw the flowers in a garden near Constantinople, and that he had to pay dearly for them. After the introduction of seed to Vienna the Tulip became rapidly disseminated over Europe, both by home-grown seed and by new importations from Turkey. In 1559 Gesner first saw the flower at Augsburg, and it is mainly upon his descriptions and pictures that the species *T. Gesneriana* was founded. One of the earliest enthusiasts was the herbalist Clusius, who propagated Tulips on a rather large scale. Fig. 2593. He did not introduce the Tulip into Holland, but the appearance of his specimens in 1591 did much to stimulate the interest in the flower in that country. The best of Clusius' plants were stolen from him, as the admirers of the Tulip were unwilling to pay the high prices he demanded. After this theft the propagation of the Tulip proceeded rapidly in Holland and the flower soon became a great favorite. The production of new varieties became a craze throughout the Netherlands, culminating in the celebrated "tulipomania" which began in 1634. The excitement continued for four years. Thirteen thousand florins were paid for a single bulb of Semper Augustus. Governmental interference was necessary in order to end the ruinous speculation. After the craze subsided, the production of varieties continued upon a normal basis, and has persisted throughout the centuries in Holland, making that country the center of the bulb-growing industry of the world down to the present day.

The introduction of the Tulip into England is credited to Clusius, about the year 1577. Tulips reigned supreme in English gardens until the beginning of the eighteenth century, when they were neglected by the rich for the many new plants from America. For a while the Tulip was considered more or less of a poor man's flower, though it has at no time been without many staunch admirers among the upper classes.

With the Turks the narrow acuminate flower-segments were in favor, while western taste preferred the rounded forms (Fig. 2595). The Turks seem to have been satisfied with a preponderance of the reds and yellows, for in the first sowings of Turkish seeds the majority of the resulting blooms were of those colors. It thus came about that flowers so colored were considered common and undesirable in the European gardens and all effort was directed to the production of the rarer white-grounded varieties with finely and distinctly marked stripes, those with a sharp bright red being the favorites. Indisputable evidence of this is seen in the old Holland "still-life" paintings of that time, where one finds none but the rarer forms represented (Solms-Laubach). All the early Tulips of direct Turkish origin had acute more or less narrow and reflexed segments. Indeed, among all the old engravings, including those of Pena and Lobel, 1570, Clusius, 1576, Dodoens, 1578, and Besler, 1613, no round-petaled forms are found. Besler's work, "Hortus Eystettensis," contains magnificent copper plates, the first in any book on plants. In some copies the plates are beautifully colored by hand. The 53 figures of Tulips in this grand work show how widely diversified was this flower even at that early date. In this and in Parkinson's "Paradisus Terrestris," 1629, many are figured with inner segments rounded and outer acute, but none vice versa (so far as could be seen), though that form is mentioned in the descriptions. The broad, rounded, erect-petaled forms were developed later, apparently first by the Dutch growers previous to and during the tulipomania, and produced wholly by selection. This ideal has prevailed down to the present time, for the narrow-petaled varieties are practically unknown among our common garden forms; so much so that the extreme typical one has been referred to a separate species (*T. acuminata*, Fig. 2602). In the Dutch fields they are now known as "thieves, and are destroyed as soon as they make their appearance.

Parrot Tulips became known towards the end of the seventeenth century. They were oftentimes considered to be monstrosities, and were pictured as such. According to Solms-Laubach, no traces of them are to be found in the old Dutch books. They were evidently developed by the French, who did not disdain the yellow and red forms, to which these belong, to such an extent as did the Hollanders. At one time they were made a separate species, *T. Turcica*, and later said to be hybrids, by one author, between *T. acuminata* and *sylvestris* (E. S. Rand, Jr., 1873), by another between *T. Gesneriana* and *suaveolens* (Mrs. Loudon, 1841). That the Parrot Tulips are hybrids is perhaps true, but to state with certainty the parents seems impossible, for as early as 1613, among the figures in Hortus Eystettensis, there is one which shows laciniation of the petals to a marked degree; sufficiently so, in fact, to be the original form from which this strain could be developed. Besides, many of our garden varieties of to-day exhibit more or less laciniation, so that it is probable that "Parrot" strains might be developed from them by simple selection.

Double Tulips seem to have made their appearance at an early date. In Hortus Eystettensis (1613), there are four forms figured, one of which, at least, seems to have been almost wholly made up of bracts, as it is shown entirely green and is described as being "wholly herbaceous and green." The other three there figured are: one red, one yellow, and the other white with maroon borders. Solms-Laubach places the advent of double Tulips at a much later date, 1665, and gives as the first authentic record the account of "*Tulipa lutea centifolia, le monstre jaune double.*" Flowers with as many as 200 petals are mentioned. A double form of "*T. serotina*" was known in 1701, and at the beginning of the nineteenth century a double form of *T. sylvestris* was described.

ARNOLD V. STUBENRAUCH.

2594. The common contemporaneous garden Tulip.

Tulip Bulb Culture in America.—From a commercial point of view the Tulip in this country has received but little consideration, which is due to the fact that its cultivation has not been considered of sufficient financial importance to warrant the undertaking, and also to the very general opinion that the industry could not be made profitable excepting in Holland and by the Dutch. There is a common notion that Dutch soil alone is adapted to the perfect development of the bulb, and that there is some secret process possessed by the Dutch alone which they will not under any circumstances reveal. Nevertheless some of our early horticulturists and florists showed conclusively that the Tulip bulbs could be grown in America even better than in Holland.

The late David Thomas, of Greatfield, near Aurora, Cayuga county, N. Y., grew from seed some of the finest Tulips, both as regards size, colors and markings, ever shown in this or any other country at that early date, which was nearly sixty years ago. The writer remembers well seeing them on exhibition at the Aurora Horticultural Society and the favor with which they were received by as critical and intelligent an audience as ever gathered around an exhibition table.

The late Isaac Buchanan propagated the Tulip very successfully from offsets at his nursery in Astoria, L. I., at about the same period, and exhibited the flowers at the first spring exhibition of the first New York Horticultural Society, carrying off the highest honors.

Recent attempts in cultivating the Tulip in various parts of the country, particularly in the West, as an industry, have been quite successful, and the work only needs to be taken up systematically and energetically to insure success. (See *Washington.*)

The Tulip is not at all particular as regards soil. It will thrive in either sand or clay, but it can be profitably grown only on a light sandy soil, as in such the bulbs increase more rapidly and are larger and more attractive in appearance, the skin being of a lovely reddish brown, while those grown in a heavy soil are smaller and of a dirty brown color. Nearly all the soil on the Atlantic coast from Maine to Florida is admirably adapted to commercial Tulip cultivation, as is much of the upland soil from Virginia southward, the light sand being almost identical with that of Holland, where the Tulip is almost exclusively grown.

While the Tulip loves moisture, perfect drainage is requisite to success. The best results are obtained when the soil has been made very rich for a previous crop; it matters but little what,—some root crop being preferable. The best manure is that from the cow-stall, which must be thoroughly rotted and evenly incorporated in the soil. Even though the soil be light and fine, it must be thoroughly worked before the bulbs are planted, which should be by the 15th of September. Plant the bulbs 4 inches below the surface in beds 4 feet in width, the rows 6 inches apart and the larger or stock-bulbs 6 inches apart in the rows. For propagation the largest and finest bulbs are always used, and selected by the dealers before filling orders.

The sets can be planted 2 inches apart in the rows, the space to be increased according to the size of the bulb. Upon the approach of winter the beds should be given a light mulch to prevent the ground freezing below the bulb. Not that the Tulip will not endure as much frost as any hardy perennial—for it will—but nearly all bulbs make certain preparations for spring flowers in winter, and when the soil around them is hard frozen this preparation cannot go on; consequently when growth starts in early spring it will be premature and feeble, and the result will be inferior flowers and a smaller increase.

Upon the approach of spring remove the mulch; this is all the work that will be required, other than to keep the surface of the soil frequently stirred with a fine rake to keep down the weeds and prevent evaporation until the flowers appear. The beginning of bloom is the all-important and critical period of the season's work, when the florist's *arcana* must be practiced but not revealed. The great secret in Tulip propagation is now open to the world, though not popularly understood.

Propagation is effected by offsets, from the fact that varieties will not reproduce themselves from seed. The seed produces only "selfs" or Mother Tulips, which only break into variegated forms at long and uncertain periods. Consequently the flowers must be cut away as soon as they appear; if not, nearly the whole of the plant's energies would go to the development of the seed,—nature's method of reproduction,—and the bulbs produced would be small and with but few or no offsets. From nature's standpoint the bulb is of consequence as a means of reproduction or perpetuation of the species only in case of failure of seed production.

2595. Round-petaled Tulips in a five-inch pot (×¼).

By cutting the flower-stems as soon as the flowers are sufficiently developed to show, there is no mistake as to variety, and the plant's energies are wholly directed to reproduction by offsets which, from large bulbs, are freely produced. There is a great difference in varieties in this respect. The increase is not far from tenfold annually; that is, the parent bulb will produce that number of offsets, which must be grown at least three years before they can be sold as first class.

By the cutting of the flower-stems the plant's period of development is materially shortened. The bulbs will mature at least four weeks earlier than the seeds would if permitted to mature. On Long Island the bulbs can be safely taken up and dried off within two weeks from the time the stems are cut. When the flowers are cut it will not do to leave them on the beds; they must be carried to some place where bulbs are not to be grown. If left upon the beds they will, as the Dutch say, "make the soil sick," and sound, healthy bulbs cannot again be produced on it until after a succession of grain and grasses. Tulips must not be returned to the same soil annually, a rotation of at least two other crops being necessary to the production of sound, vigorous bulbs.

A hundred thousand salable bulbs can be grown on a single acre. They require three years from the sets. The first year double that number can be grown. The average yield or output will be 66,000 bulbs to the acre.

In this country where land admirably adapted to the cultivation of Tulip bulbs can be had at not more than fifty dollars per acre, in comparison with land in Holland worth $5,000 per acre, the industry could be made a profitable one.

C. L. Allen.

It is a matter of great regret that the key used below is based upon a technical botanical character of no interest to the horticulturist, but it seems to be impossible to group the species according to the color and shape of the flowers.

SUMMARY OF GROUPS.

I. *Outer bulb-tunic glabrous inside*...Species 1–2
II. *Outer bulb-tunic with a few appressed hairs inside towards the top*.....Species 3–12
III. *Outer bulb-tunic with scattering appressed hairs all over inside*.............Species 13–20
IV. *Outer bulb-tunic pubescent inside, densely so at apex* ....Species 21–23
V. *Outer bulb-tunic pilose inside*......Species 24–26
VI. *Outer bulb-tunic woolly at base inside.* ....Species 27–30
VII. *Outer bulb-tunic everywhere woolly inside.* ....Species 31–32
VIII. *Outer bulb-tunic always hairy at base inside around root crown, and usually with a few scattering hairs above but sometimes without them*..........Species 37–42

INDEX.

acutifolia, 20.
acuminata, 21.
alba, 20.
albo-maculata, 42.
Aleppica, 34.
Armena, 24.
australis, 38.
Batalini, 30.
Biebersteiniana, 33.
biflora, 31.
Billietiana, 19.
carinata, 8.
Clusiana, 32.
Dammanni, 23.
Didieri, 20.
Dracontia, 42.
Eichleri, 4.
elegans, 13.
flava, S. L.
fragrans, 1.
fulgens, 40.
Gesneriana, 42.
Greigi, 3.
Hageri, 2.
Kaufmanniana, 18.
Kesselringi, 15.
Kolpakowskiana, 5.
Korolkowi, 17.
Julia, 29.
lanata, S. L.
Leichtlini, 36.
linifolia, 28.
Lorteti, 34.
Lownei, 27.
lutescens, 20.
Lycica, 34.
macrospeila, 41.
maculata, 14.
Mauriana, 20.
Maximowiczii, 26.
montana, 29.
Oculus-solis, 34.
Ostrowskiana, 11.
Persica, S. L.
planifolia, 20.
platystigma, 25.
præcox, 35.
pulchella, 6.
retroflexa, 22.
saxatilis, 16.
spathulata, 42.
Sprengeri, 12.
Strangewaysiana, 42.
suaveolens, 37.
sylvestris, 10.
violacea, 7.
viridiflora, 39.
vitellina, 9.

GROUP I. *Outer bulb-tunic glabrous inside.*

A. *Perianth yellow, flushed with green outside* ....1. **fragrans**
AA. *Perianth crimson tinged with yellow outside* ....2. **Hageri**

1. **fràgrans**, Munby. Height 6–12 in.: proper lvs. 3, crowded at middle of stem, linear or lorate: fls. yellow, greenish outside; perianth funnelform-campanulate, 1–1½ in. long, 3 in. across, slightly fragrant; segments all acute; filaments bearded at base: ovary slightly narrowed at collar; stigmas small. Algeria. Gn. 45:965.—Allied to *T. sylvestris*, differing in position of the leaves and segments uniformly wide.

2. **Hàgeri**, Held. Height 6 in.: lvs. 4–5, lorate acute, not undulate: fls. chiefly red, about 2 in. across; perianth broad-campanulate, 1¼ in., inodorous; segments acute, red, with a large, green or purple-black basal blotch margined with yellow; stamens purple-black; filaments linear, bearded at base: ovary narrowed at collar; stigmas small. Hills of Parnes range in Attica. B.M. 6242. F. 1877:169.

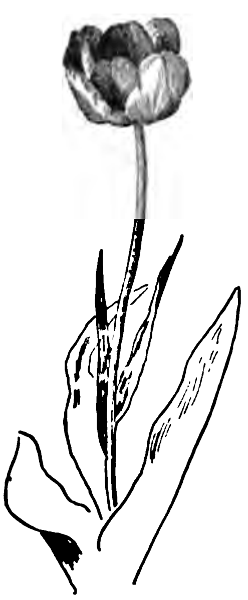
2596. The open spreading form of Tulip (×⅓).

GROUP II. *Outer bulb-tunic with a few appressed hairs inside towards the top.*

A. *Stem pubescent.*
  B. *Lvs. blotched with linear chestnut-brown spots: filaments not bearded at base.* 3. **Greigi**
  BB. *Lvs. not blotched: filaments bearded at base.:*.......... 4. **Eichleri**
AA. *Stem glabrous (T. Kolpakowskiana sometimes obscurely pubescent).*
  B. *Lvs. ovate or broadly lanceolate.*
    C. *Filaments bearded at base.* 5. **Kolpakowskiana**
      6. **pulchella**
      7. **violacea**
    CC. *Filaments not bearded*.... 8. **carinata**
      9. **vitellina**
  BB. *Lvs. linear or linear-lanceolate.*
    C. *Filaments bearded at base.*10. **sylvestris**
    CC. *Filaments not bearded* ....11. **Ostrowskiana**
      12. **Sprengeri**

3. **Greigi**, Regel. Height 2–8 in.: lvs. usually 4, obscurely downy, much undulate toward cartilaginous border: perianth campanulate, 3–3½ in. long, 5 in. across, spreading abruptly from about the middle, bright crimson with a large dark basal blotch, margined with yellow; segments uniform, obovoid, cuspidate or emarginate; anthers yellow; filaments black, glabrous: ovary narrowed at collar: stigmas yellow, twice as broad as neck of ovary, reflexed. Turkestan. B.M. 6177. F.S. 21:2261. F. 1876:217.—Early-blooming.

4. **Eichleri**, Regel. Height 6 in.: lvs. 12–15 in. long, lanceolate acuminate, margins plane and smooth: perianth broadly campanulate, 2½-3½ in. across, deep scarlet with a broad, cuneate, dark violet-blue basal blotch margined with yellow; segments rounded at top with a mucro; anthers violet-brown; filaments black; stigmas very thick, undulate, pale yellow. Georgia in Asia. B.M. 6191. F. 1877: 169. — Allied to *T. Greigi*.


2597. A Darwin Turnip (×¼). See No. 42.

2598. Acute-petaled style of Tulip (×¼).

5. **Kolpakowskiàna**, Regel. Height 12 in.: lvs. 3–4, obscurely ciliate on margin: bud nodding: perianth campanulate, 2–2½ in. long, 4½ in. across, faintly scented, varying from bright scarlet to bright yellow, typically red with a faint yellow-black blotch at base; segments oblong, acute, the outer spreading away from the inner as the flower expands; anthers dark purple: ovary large, stout: stigmas large, crisped. Turkestan and Central Asia, 1877. B.M. 6710. Gn. 60, p. 182.—A near ally of *T. Gesneriana*, which it bids fair to rival in beauty and variability under cultivation.

6. **pulchélla**, Fenzl. Height 4 in.: lvs. 2–3, crowded and spreading close to the surface of the ground, channeled, obscurely ciliate on edges: perianth funnelform, erect, 1–1½ in. long, 2½ in. across, bright mauve-red above, passing downward into a slaty lilac without any dark-colored blotch, but bright yellow at base; segments all acute, densely pilose at base; filaments linear: ovary clavate: stigmas less than ovary-diameter. Alpine region of Cilician Taurus, 1877. B.M. 6304. — A dwarf species near to *T. Hageri*.

7. **violàcea**, Boiss. & Buhse. Less than 12 in. high: lvs. 3–5, crowded: perianth campanulate with a contracted base, 1½ in. long, 2 in. wide, fragrant, typically bright mauve-red or rosy crimson flushed with purple, varying to white with a slight flush of red outside, with a large brown or black basal blotch, usually bordered with white; segments uniformly oblong, subacute; stamens black or purple; stigmas small. Persia. Int. to cult. 1890. B.M. 7440. G.M. 39:390.—Allied to *T. Hageri* and *pulchella*.

8. **carinàta**, Hort. Krelage. Lvs. 3, not crowded, as long as fl.-stalk, slightly undulate, slightly ciliate on edge near base; perianth open-campanulate, 3 in. long, dark scarlet, tinged with green just above and blending into a bright yellow basal blotch; segments acute, cuspidate; stamens yellow: ovary prismatic: stigmas white, not undulated. Habitat unknown. Vars. **rùbra** and **violàcea**, Hort., are offered.

2599. A Parrot Tulip—Tulipa Gesneriana, var. Dracontia (×⅓).

9. **vitellina**, Hort. Lvs. 4, not crowded, as long as fl.-stalk, not undulated, thinly ciliate on edge: peduncle slightly tinged with red near fl.: perianth campanulate, 2 in. long, sulfur-yellow, no basal blotch; inner segments rounded, outer acute; filaments yellowish white; stigmas not undulated. — Said to be "hybrids between *T. suaveolens* and *T. Gesneriana*." It is one of the "Cottage Garden" Tulips, a class of old-fashioned Tulips which have been preserved from oblivion in the gardens of the poor. Attempts have been made recently to restore them to popular favor. Well worth attention.

10. **sylvéstris**, Linn. Fig. 2601. Height 9–15 in.: lvs. usually 3, at base of scape, channeled, linear-lorate: peduncle sometimes 2-fid. in cultivation: bud nodding; perianth funnelform-campanulate, 1½–2 in. long, yellow; segments all acute, inner narrower: ovary bladder-form (narrowed at collar): stigmas smaller than ovary-diameter, yellow. Said to be native in England and widely so in Europe.—In cultivation as *T. Florentina* and *T. Florentina*, var. *odorata*.

11. **Ostrowskiàna**, Regel. Height 12 in.: lvs. 3, flat, ciliate on edge: perianth open-campanulate, 2–3 in. across, non-odorous, scarlet with small brown basal spot, margined with yellow at top; segments tapering at base and top; filaments dark wine-red: ovary prismatic, white striped with green, red near top: stigmas equal to ovary-diameter, scarlet. Introduced from Turkestan in 1881. B.M. 6895. Gn. 45:965.—Allied to *T. Oculus-solis*.

12. **Sprèngeri**, Baker. Height 10–18 in.: lvs. 4, close together, long, linear-lanceolate, stiff: peduncle wiry, tinged with deep red under fl.: perianth open-campanulate (star-shaped), 2 in. long, bright scarlet with a somewhat dull brown basal blotch margined all around with dull orange-yellow, all blending into one another;

segments all oblong-ovate and cuspidate; filaments reddish brown: ovary pyramidal, reddish: stigmas equal to narrow collar. Hab. (?). Imported by Dammann & Co., of Naples, in 1894. Gn. 56:1251. Gt. 44:1411.

GROUP III. *Outer bulb-tunic with scattering appressed hairs all over inside.*

A. *Stem pubescent (T. maculata finely so and sometimes glabrous).*
  B. *Perianth usually bright red with a yellow basal blotch*...13. **elegans**
  BB. *Perianth orange-scarlet or red, with a dark brown, purplish or bluish black basal blotch*.14. **maculata**
AA. *Stem glabrous.*
  B. *Lower lvs. lorate or linear-lanceolate*....................15. **Kesselringi**
  BB. *Lower lvs. lanceolate or broadly so.*
    C. *Filaments bearded at base*..16. **saxatilis**
    CC. *Filaments not bearded.*
      D. *The perianth segments all rounded at top*..........17. **Korolkowi**
      DD. *The perianth segments all acute at top*.............18. **Kaufmanniana**
      DDD. *The inner perianth segments rounded: outer acute at top*.............19. **Billietiana**
20. **Didieri**

13. **élegans,** Hort. Height 12–18 in.: lvs. 3–4, below middle of stem, lorate-lanceolate, finely ciliate upon upper face: perianth campanulate, 3–3½ in. long: segments uniform, narrowed gradually to a very acute point; anthers violet; filaments glabrous; stigmas larger than ovary-diameter, yellowish.—Known in gardens only. Krelage catalogues a variety as "Cottage *elegans picotee*," which has larger lvs. and white flowers edged with rose, and without basal blotch. "Probably a hybrid between *T. acuminata* and *suaveolens*."

2600. A pan of Murillo Tulips, one of the few double varieties that are really desirable (×¼).

14. **maculàta,** Hort. Height 12–18 in.: lvs. 3–4, lorate-lanceolate: perianth campanulate, 2–2½ in.; segments obovate, cuspidate, very wide beyond middle; anthers purple; filaments glabrous; stigmas small.—"A well-marked garden race" (*Baker*).

15. **Késselringi,** Regel. Lvs. 4–5, crowded at base of stem, lorate-lanceolate, channeled: peduncle sometimes obscurely puberulent: perianth campanulate, 1½–2 in. long, bright yellow, flushed with red and green outside; inner segments subobtuse, outer acute; stamens bright yellow; filaments glabrous; stigmas not equal to ovary-diameter. Turkestan. B.M. 6754.

16. **saxátilis,** Sieber. Height 12 in. or more: stem usually branched low down and bearing 2 fls.: lvs. usually 3, sometimes lowest 12 in. long: perianth oblong-funnelform, 2–2½ in. long, 3 in. across, light mauve-purple, at base bright yellow; segments pubescent at base, inner obovate, outer oblong; anthers blackish; filaments bright yellow: ovary prismatic: stigmas small. Crete, 1878. B.M. 6374. Gn. 56:1234.

17. **Korolkòwi,** Regel. Height 6–9 in.: lvs. 2–3, falcate, margin crisped: perianth campanulate, red, with a distinct black basal blotch; inner segments oblong, outer obovate; filaments lanceolate; stigmas small. Turkestan, 1875.

18. **Kaufmanniàna,** Regel. Less than 12 in. high: lvs. 2–3; perianth subcampanulate, 2–3 in. long, 2½–4 in. across, bright yellow in original form, tinged with red outside, without basal blotch; in cultivation very variable in color and nearly always with a deep yellow basal blotch; anthers lemon-yellow, linear; filaments bright orange, linear flattened: ovary pyramidal: stigmas small in cultivated form, but described as large. Turkestan, 1877. B.M. 6887.

19. **Billietiàna,** Jord. & Four. Lvs. 3–4, undulate, not ciliate on edge: perianth open-campanulate, 2 in. long, 3½ in. across, inodorous, bright yellow, flushed with scarlet-pink, especially outside, with obscure basal blotch striated with blue-black lines; anthers dark gray or blackish; filaments yellow, with dark striations: ovary narrowed at collar: stigmas light yellow, very large and crisped. Savoy, Italy. B.M. 7253. G.M. 38:311.—One of the late Tulips.

20. **Didièri,** Jord. Height 12–18 in.: lvs. 3–4, undulate, acuminate: perianth campanulate, 2–2½ in. long, 4½ in. across, bright crimson, with purple basal blotch margined with yellow or yellowish white; outer segments reflexed; stamens same color as basal blotch: ovary narrowed at collar: stigmas larger than collar-diameter, white. Savoy, Italy and Alps. B.M. 6639.—Var. **Mauriàna,** Jord. Lvs. narrower, slightly undulate: perianth brilliant red, with wide yellow blotch. Var. **planifòlia,** Jord. Stem slender: lvs. narrow, not undulated: perianth deep red, faintly marked with yellowish red or blackish blotch. Var. **acutifòlia,** DC. A cultivated form: peduncle 5–8 in. long: lvs. oblong-lanceolate. Var. **álba,** Krelage. Peduncle stiff, mottled with red: perianth light lemon-yellow, or white tinged green outside, basal blotch limited to a few dark striations; filaments same color as flower. Var. **lutéscens,** Krelage. Lvs. 3, slightly falcate: perianth light yellowish white streaked with red, with a bluish violet, dark basal blotch; filaments colored like spot.

GROUP IV. *Outer bulb-tunic pubescent inside, densely so at apex.*

A. *Perianth segments very long, linear and acuminate*...................21. **acuminata**
AA. *Perianth segments oblong, all uniform and acuminate*.............22. **retroflexa**
AAA. *Perianth segments all narrowly oblong; inner acute, outer rounded at top*..........................23. **Dammanni**

21. **acuminàta,** Vahl. Figs. 2602, 2603. Height 12–18 in.: lvs. 4, lowest lanceolate, all undulated at margins: peduncle shining: perianth very open, light yellow splotched with red lines; segments sometimes 4½ in. long, less than ½ in. wide, with edges rolled in; stamens yellow; filaments flattened, glabrous: ovary prismatic: stigmas very large, yellow, not undulated. Turkey (?).

22. **retrofléxa,** Hort. Lvs. long-lanceolate, sometimes linear-lanceolate, slightly ciliate on edge, otherwise glabrous: peduncle somewhat shining: bud nodding; perianth open funnelform-campanulate, yellow, a shade darker at base—a trace of a very obscure basal blotch; segments uniform in width, linear-lanceolate acuminate, twisted, with undulated edges; stamens yellow; filaments flattened, glabrous.—A supposed garden hybrid between *T. Gesneriana* and *acuminata*.

23. **Dámmanni,** Regel. Height 6 in.: lvs. 4, placed whorl-like at middle of stem, linear-lanceolate, recurved, obscurely bristly, ciliate on margin, otherwise glabrous: peduncle glabrous: perianth spreading, star-shaped, purplish or reddish with an oblong-lanceolate black

blotch without yellow border; segments narrowly oblong; filaments filiform, glabrous; stigmas broader than ovary-diameter. Mt. Lebanon, 1889. Gt. 38:1300. —Allied to *T. linifolia* and *Maximowiczii*.

GROUP V. *Outer bulb-tunic pilose inside.*

A. *Lower lvs. lanceolate.*
  B. *Lvs. slightly or not at all undulated*......................24. **Armena**
  BB. *Lvs. very much undulated*.....25. **platystigma**
AA. *Lower lvs. linear*...............26. **Maximowiczii**

24 **Armèna**, Boiss. Lvs. 5, crowded at base of stem, falcate, glaucous and glabrous, slightly undulated, long, ciliate on edge all around, longer than fl.-stalk: peduncle glabrous, finely dotted, perianth open campanulate, slightly sweet-scented, 2 in. long, dark scarlet with black basal blotch margined all around with yellow; inner segments rounded, outer acute; anthers purple; filaments flattened, black, not bearded. — This species is referred by Baker without hesitation to *T. Gesneriana*, but the plants in the trade as *T. Armena* differ as indicated above.

2601. Tulipa sylvestris, known also as T. Florentina, var. odorata (X ¼).

25. **platystigma**, Jord. Height 18 in.: stem slender, glabrous: lvs. 3–4, very much undulated: peduncle glabrous: perianth campanulate, 2 in. long, violet-scented, magenta-red; segments obovate-oblong; claw blue tinted with a yellow spot in the middle; filaments not bearded: anthers violet-colored: ovary prismatic: stigmas very large and undulated. France.

26. **Maximowiczii**, Regel. Lvs. erect: peduncle glabrous: perianth crimson, with a black basal blotch; segments obtuse, ending in a short, sharp point; anthers light purple; filaments linear, not bearded. Eastern Bokhara, 1889. Closely allied to *T. linifolia*, from which it differs in having outer bulb-tunic hairy at apex (not woolly), erect lvs. and sharp-pointed perianth-segments. Gt. 38:1307. G.C. III. 19:757.

GROUP VI. *Outer bulb-tunic woolly at apex inside.*

A. *Filaments bearded at base*............27. **Lownei**
AA. *Filaments not bearded.*
  B. *Perianth crimson or scarlet, with a distinct basal blotch*...............28. **linifolia**
  29. **montana**
  BB. *Perianth yellow, without basal blotch*.30. **Batalini**

27. **Lównei**, Baker. Height 2–4 in.: stem glabrous, sometimes 2-headed: lvs. 2, lanceolate, acuminate, falcate, glabrous: peduncle slender, glabrous: bud slightly nodding; perianth funnelform, small, white with a bright yellow basal blotch, tinged outside with light purple or purplish pink, inner segments wider; stamens yellow: ovary narrowed at collar: stigmas very small. Mts. of Syria and Palestine, 1874.

28. **linifòlia**, Regel. Stem somewhat shining, sometimes 2-headed: lvs. 7, linear and grass-like, spirally arranged, spreading, glabrous: perianth open-campanulate, small, bright scarlet; basal blotch bluish black; inner segments oblanceolate, outer ovate and slightly wider; anthers pinkish; pollen gray; filaments bluish black: ovary pyramidal: stigmas very small, yellowish white. Bokhara.

29. **montàna**, Lindl. Height 4–8 in.: lower lvs. oblong-lanceolate, acuminate, undulated, very glaucous: peduncle glabrous: perianth campanulate, 1⅛–2 in. long, 2 in. across, deep crimson, paler outside; segments ovate or oblong, flat, acute, the inner often obovate obtuse; filaments purplish: ovary prismatic: stigmas small. Mts. of Persia. B.R. 13:1106.—Var. **Jùlia**, K. Koch. Dwarf, from Caucasus. Not more than 3–4 in. tall: fls. bright red, 1 in. or less long; all 6 segments obovate and obtuse.

30. **Batalini**, Regel. Height 5 in.: stem glabrous: lvs. 5, crowded into a sort of whorl just below middle of stem, linear-lanceolate, glabrous, slightly undulated: perianth campanulate, slightly funnelform; segments oblong-ovate, obtuse, sometimes deeply incised on the edge near the top; filaments linear, terete, yellow: ovary elliptic-oblong, compressed, trigonous: stigmas coroniform. Eastern Bokhara, 1889. Gt. 38:1307. G.C. III. 19:759.—One of the early Tulips.

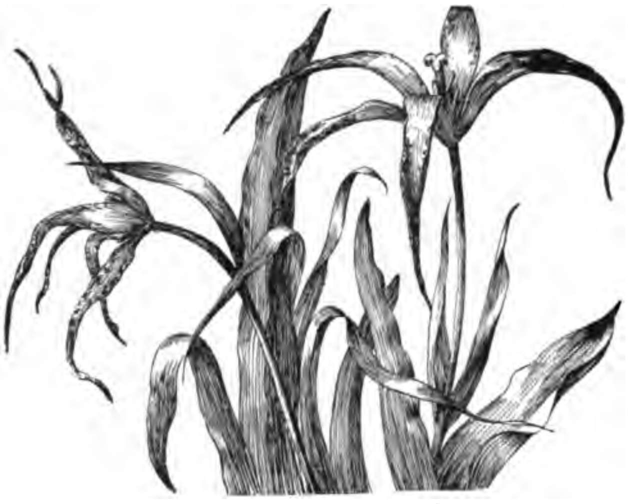
2602. One of the acuminate-petaled forms — the old Turkish-garden ideal (X ⅛). No. 21.

GROUP VII. *Outer bulb-tunic everywhere woolly inside.*

A. *Filaments bearded at base.*
  B. *The filaments flattened*......31. **biflora**
  BB. *The filaments cylindric*......32. **Clusiana**
AA. *Filaments not bearded.*
  B. *Perianth bright yellow, with obscure basal blotch or none*.33. **Biebersteiniana**
  BB. *Perianth bright scarlet, with a distinct black or purplish basal blotch margined with yellow*......................34. **Oculus-solis**
  35. **praecox**
  BBB. *Perianth with outer segments rich, bright purple or purplish red broadly margined with white: inner segments yellowish white*............36. **Leichtlini**

31. **biflòra**, Linn. Height 3–6 in.: stem glabrous or slightly pilose, usually 2- or 3-fld., rarely 4- or 5-fld.: lvs. often 2, sometimes 3, linear, long: perianth funnelform-campanulate, 1 in. long, 2 in. across, pale yellow or white inside, tinged with green or red or even purplish outside; segments acute; filaments flattened, ciliated at base: ovary narrowed at collar: stigmas small. Mts. of Central Siberia and the Caucasus. B.R. 7:535. B.M. 6518.

32. **Clusiàna**, Vent. Height 12–18 in.: stem slender, glabrous: lvs. 4–5, very long and narrow and folded double, linear-acuminate, pendent: peduncle slender, tinged with brown directly under fl.: perianth small, when open 2 in. across, funnelform-campanulate, very fragrant, bright lemon-yellow tinged with green outside, or white flushed with red; segments acute; claw hirsute on edge; stamens yellow; filaments cylindric, densely bearded at base: ovary pyramidal: stigmas small, tinged with red. Portugal, through Mediterranean region to Greece and Persia. B.M. 1390.



2603. Tulipa acuminata (×½).

33. **Biebersteiniàna**, Schult. f. Height 6 in.: stem slender, glabrous: lvs. 2–4, crowded together, long, channeled, glabrous, slightly ciliated on edge; bud slightly nodding; perianth open-campanulate, 2½ in. long, bright yellow tinged with scarlet-pink on edges and sometimes green outside; at base a brownish yellow discoloration; inner segments obtuse, outer acute; anthers gray; pollen yellow; filaments yellow: ovary prismatic: stigmas yellow, undulated. Asia Minor.

34. **Óculus-sòlis**, St. Aman. Height, 12–18 in.: stem slender, glabrous: lvs. 3–4, lorate-lanceolate, acute, glabrous: perianth funnelform-campanulate, 2½–3 in. long, 4½ in. across, scentless, erect; segments very acute, the inner ones often less so; anthers yellow; filaments purple: ovary prismatic. South of France, Italy and Switzerland. B.R. 5:380 (as *T. Gesneriana*).—Var. **Lortéti**, Baker. A slight variety, the basal spot oblanceolate and black. Marseilles. Var. **Lýcica**, Baker. Stem 6–8 in. long: lvs. crowded: perianth-segments all acute, inner oblanceolate-oblong; apex subdeltoid; blotch black; anthers and filaments dark purple. Lycia, Asia Minor. Var. **Aléppica**, Baker. A form with fls. considerably smaller than W. European type, with a smaller black basal blotch. Asia Minor, Syria and Palestine.

35. **præcox**, Tenore. Height, 12–18 in.: stem slender, glabrous: lvs. 3–5, lorate-lanceolate, acute, undulated at margin: perianth campanulate, 2–3 in. long, 3 in. across, erect, scentless: basal blotch, purplish black, margined with yellow; segments widely imbricated, outer slightly longer, acute, puberulent at apex; inner shorter, obtusely cuspidate; anthers yellow; filaments long, dark purple, glabrous: ovary prismatic: stigmas pubescent, reddish. Italy and Southern France; also Algeria, Greece, Syria, Palestine and Persia. Very closely allied to last, and figured as such in B.R. 3:204; 14:1143; 17:1419.—One of the oldest known species.

36. **Leichtlini**, Regel. Height 9–18 in.: stem glabrous: lower lvs. linear-lanceolate: perianth between campanulate and funnelform, outer segments narrow and acute, inner much shorter and obtuse at apex. Kashmir. Gn. 40:819.

GROUP VIII. *Outer bulb-tunic always hairy at base inside around root crown, and usually furnished with a few scattering hairs above, but sometimes without them.*

A. *Stem and lvs. pubescent*...........37. **suaveolens**
AA. *Stem and lvs. glabrous.*
  B. *Leafy only at base of stem.*
    C. *Lvs. lanceolate*.................38. **australis**
    CC. *Lvs. linear or lorate*...........39. **viridiflora**
  BB. *Leafy to middle of stem or above.*
    C. *Perianth uniformly dark scarlet with a bright yellow basal blotch*........................40. **fulgens**
    CC. *Perianth uniformly with a blackish basal blotch, bordered with bright yellow*...........41. **macrospeila**
    CCC. *Perianth variable, but rarely with a bordered dark basal blotch*........................42. **Gesneriana**

37. **suavèolens**, Roth. EARLY GARDEN TULIPS. Height 3–6 in.: lvs. 3–4, mostly at base of stem, lowest lorate-lanceolate and broad: perianth campanulate, 1–2½ in. long, erect, fragrant, bright red or yellow or variegated: segments all acute; filaments glabrous; anthers yellow: ovary prismatic: stigmas very large. Southern Russia and Southern Europe, but possibly only a naturalized form of old introduced Turkish garden varieties. F.S. 12:1223. B.M. 839.

38. **austràlis**, Link. Height 12–18 in.: stem slender: lvs. 2–3, crowded together at lower portion of scape, channeled: bud nodding; perianth 1½ in. across, funnelform-campanulate, yellow, outside reddish; segments oblanceolate-oblong acute, at apex slightly puberulent; anthers yellow; filaments flattened, bearded at base: ovary narrowed at collar. Savoy, France, Spain, Portugal and Algeria. B.M. 7171. Gn. 45:965.

39. **viridiflòra**, Hort. (?). Outer bulb tunic glabrous except around root-crown, where there is a dense fringe: stem glabrous and glaucous: lvs. lorate-lanceolate, undulated, glabrous, glaucous, edges slightly ciliated near base: fl. large, soft green, edged with yellow or white. Gn. 32:625.—Garden form. Bears some resemblance to a Parrot Tulip.

40. **fúlgens**, Hort. Garden form. Height 8–18 in.: lvs. 3, lanceolate or ovate, very wavy: perianth-segments all oblong ovate, acute; anthers yellow; pollen yellow; filaments white, flattened, glabrous: ovary prismatic: stigmas small, not wavy.

41. **macrospeila**, Baker. A supposed hybrid of unknown origin: height 10–18 in.: lvs. 3–4, long and narrow, lowest long-lanceolate, flat, pendent: peduncle wiry: perianth campanulate, slightly funnelform, emitting a heavy, sweetish, unpleasant odor, bright crimson to cerise or cherry red, with a distinct, nearly black cuneate basal blotch broadly margined with yellow or yellowish white at top; segments obtuse or outer sometimes acute, outer reflexed, inner erect; filaments dilated, white at base, black, violet or striated above, glabrous: ovary prismatic, creamy white: stigmas same color, large, slightly undulated.

42. **Gesneriàna**, Linn. COMMON GARDEN OR LATE TULIPS. Figs. 2594–2600. Height 6–24 in.: stem erect: lvs. 3–4 or more, lower lorate-lanceolate or ovate-lanceolate, often undulated, glaucous, pubescence variable: peduncle erect: perianth campanulate, 1–2½ in. long, inodorous, bright red or vari-colored, when bright red, with only an obscure basal blotch, which is usually yellow, but may be dark or even blackish or mixed, sometimes white; segments all obovate-oblong, obtuse, broadly rounded at apex, often with a small cusp in the

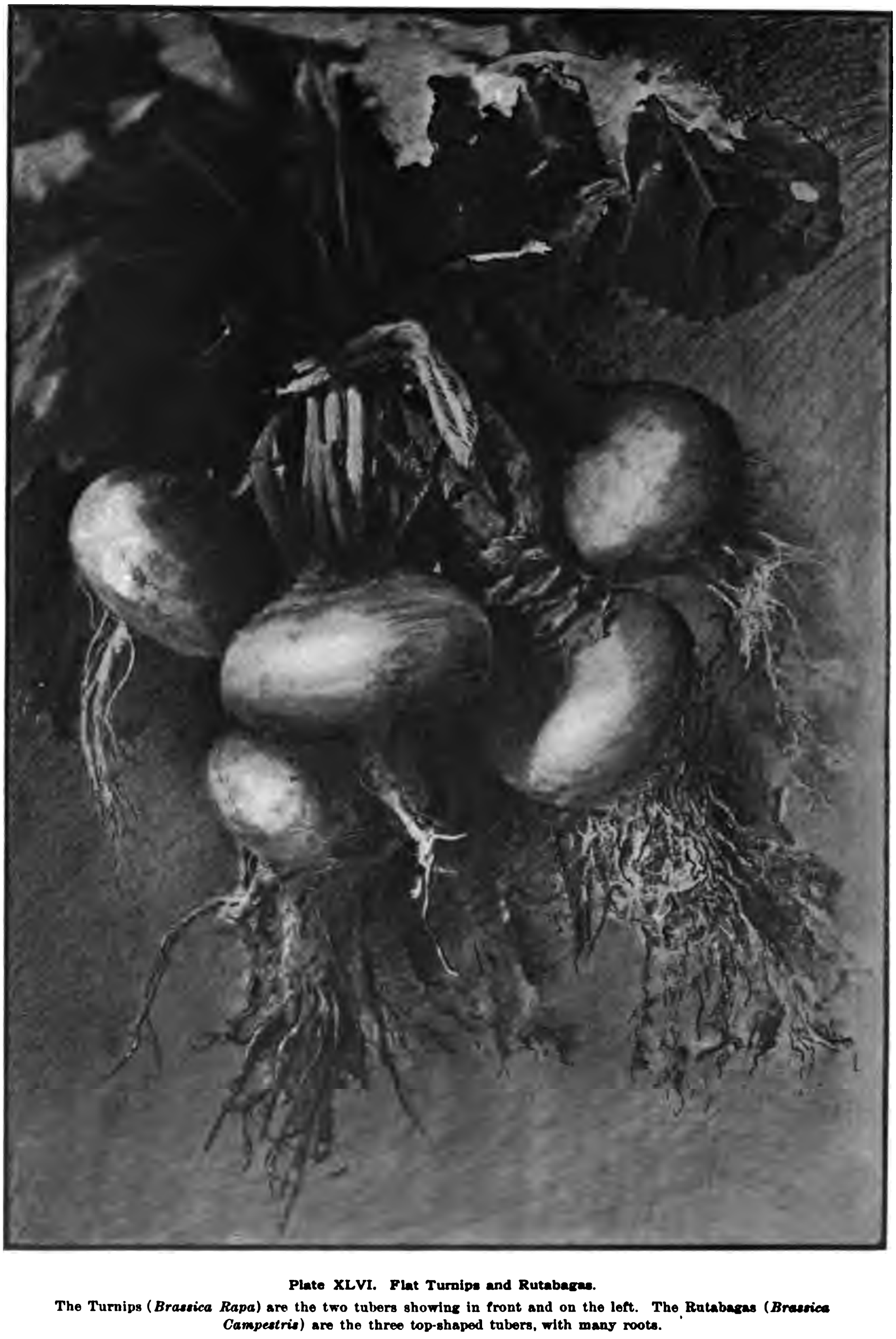
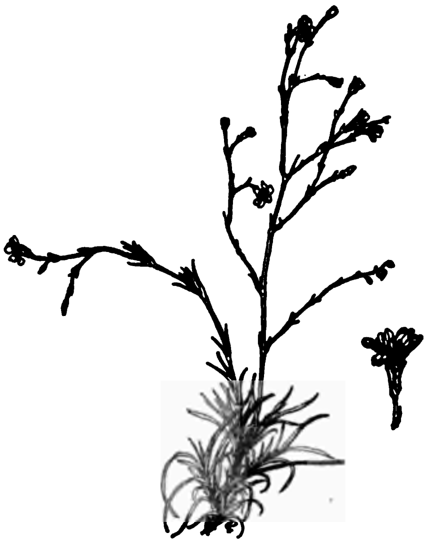


Plate XLVI. Flat Turnips and Rutabagas.

The Turnips (*Brassica Rapa*) are the two tubers showing in front and on the left. The Rutabagas (*Brassica Campestris*) are the three top-shaped tubers, with many roots.

center; filaments glabrous, flattened: ovary prismatic: stigmas large and usually crisped. Origin uncertain. Introduced from the Turkish gardens in 1554. Long since hybridized and cultivated out of all semblance to any wild forms. Supposed original form (Baker) in B.M. 6439 (as *T. Schrenki*). Darwin tulips (Fig. 2597) are a recent strain of long-stemmed, late, self-colored tulips.



2604. **Tunica Saxifraga.** Flower about natural size.

Var. **Dracóntia,** Baker (Fig. 2599). PARROT TULIP. Similar in habit: perianth usually yellow and red striped and splotched; segments deeply cleft and laciniately dentate. F.S. 21:2211 (as *T. Turcica*).

Var. **spathulàta** (*T. spathulàta*, Bertol.). This differs from the type in its larger fls. of a brilliant red color, with a large purplish black blotch at the base of each of the segments. Italy.—Probably the largest of the wild Tulips. Catalogued by many bulb growers as "*T. G. vera*."

Var. **Strangewàysiana,** Reboul. Very large, brilliant, dark scarlet flowers, with a handsome dark basal blotch. One of the naturalized Tulips found without disposition to vary in fields near Florence, Italy. F. 1880:65.

Var. **álbo-oculàta,** Krelage. Deep campanulate fl., with a slight sweetish mawkish odor, bright red, with a distinct white basal blotch; inner segments obtuse, outer acute; filaments white.

T. flàva, Hort., Krelage, is "often confused with vitellina in gardens, though perfectly distinct. Flava is yellow, very robust, tall, and at least a fortnight later in blooming. Vitellina is almost white when old" Imperfectly known.—*T. lanàta*, Regel. Dwarf: fls. large, goblet-shaped, rich vermilion, with a large black spot at the base of each of the segments. Imperfectly known.—*T. Pérsica*, Willd., is a synonym of T. patens, Agardh, a Siberian species not known to the trade. It has fls. about 3 in. across, greenish outside, whitish inside, with a yellow eye. The outer segments are narrower. It is figured in B.M. 3887 as T. tricolor. T. Persica of the trade has been confused by the Dutch with T. Breyniana, Linn., the proper name of which is Bæometra Columellaris, Salisb. Bæometra is a monotypic genus native to South Africa. There are no true Tulips in South Africa. The important generic distinction between Bæometra and Tulipa lies in the dehiscence of the capsule; that of the former is septicidal, of the latter loculicidal. Bæometra is figured in B.M. 767 as Melanthium uniflorum. It is a dwarf plant 4–6 in. high with funnel-shaped fls. about 1 in. across, yellow within, tinged with deep brownish red outside. The segments are oblong and subequal. Although a native of the Cape, the plant is supposed to be hardy.

ARNOLD V. STUBENRAUCH.

TULIP, BUTTERFLY. *Calochortus.* **Tulip Poppy.** *Hunnemannia.* **Tulip Tree.** *Liriodendron.*

TUNA. *Opuntia Tuna.*

TÙNICA (Latin, a *tunic* or *coat*, from the imbricated involucre). *Caryophyllàceæ.* Small slender herbs with linear opposite leaves, with habit of Gypsophila, but botanically more nearly allied to Dianthus. From Dianthus they differ in smallness, the central flower of the cluster not bracteate, the calyx top-shaped or cylindrical rather than short-tubular and 5- or 15-ribbed, the calyx-teeth obtuse; petals 5 and styles 2. There are about 10 species in Southern Europe and in Asia. **T. Saxífraga,** Scop. (Fig. 2604), apparently the only species in cultivation in this country, is a tufted spreading hardy species suitable for rockwork and blooming in summer and fall (see bottom p. 737). It is a wiry-stemmed perennial, growing 6–10 in. high: fls. small, with rosy white, lilac or pale purple notched petals. A recent novelty is a double flowered variety. It is more compact and dwarf than the type, and the fls. last longer. Tunicas are propagated by seeds or division. *T. Saxifraga* has become adventive in some parts of the east.

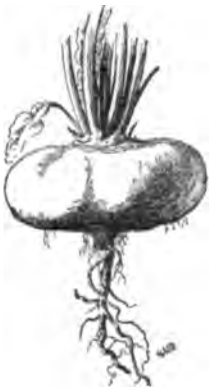
L. H. B.

TÙPA. See *Lobelia.*

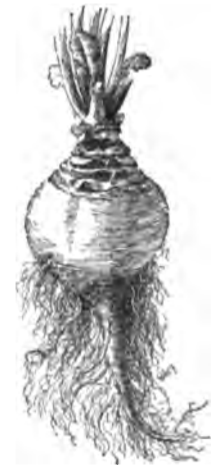
TUPELO. See *Nyssa.*

TURK'S HEAD. *Melocactus communis.*

TURNIP (Plate XLVI) is a name somewhat loosely applied to two species of vegetables. In this country, and apparently properly, it is applied to vegetables characterized by thick light-fleshed roots that are usually more or less flattened or at least not greatly elongated, with leaves that are hairy and not glaucous. These vegetables belong to the species *Brassica Rapa* (see page 178). In the term is sometimes included the Swedish Turnip or Rutabaga, a plant that is characterized by having a more uniformly elongated-oval yellow-fleshed tuber with roots springing from its lower portion, a thick elongated leafy neck, and glaucous-blue leaves that are not hairy. This plant, however, is considered to be *Brassica campestris.* Whether these two species exist separately in wild nature is not positively known, but they appear to be well defined under cultivation. Both species tend to run wild in old fields and to lose their thickened roots. They are then sometimes, though erroneously, known as charlock. The nativity of these species is unknown, but they are almost certainly European or Asian in origin. Characteristic tubers of these two plants are contrasted in Figs. 2605 and 2606. The former is commonly known here as "flat turnip" and the latter as rutabaga or merely "baga." According to Vilmorin, the plant that we know as Rutabaga is known to the French as chou-navet and in England as Swedish Turnip and turnip-rooted cabbage.



2605. **Turnip—Brassica Rapa.**



2606. **Rutabaga—Brassica campestris.**

The culture of Turnips and Rutabagas is very similar, except that the Rutabaga requires a longer season in which to grow. The Rutabaga is nearly always grown as a main-season crop, whereas the Turnip may be sown very late for winter use or very early for late spring or summer use. Usually the flat Turnip is not grown during the hot weather of summer. In the northern states it is sown from the middle of July to the middle of August for late crop, or on the first approach of spring in order that tubers may be had for the early vegetable market. The late or winter crop is ordinarily used for storing in cellars and also for feeding, whereas the early crop is often sold in bunches in the open market, and later by the basket or bushel.

The Turnips and Rutabagas are hardy; that is, the young plants can withstand some frost. They are cold weather plants and demand loose, moist soil. Usually the seeds are sown in drills which stand from 10 to 20 inches apart. In the drills the plants are thinned until they stand from 6 to 10 inches apart, depending on the variety that is to be grown. For general field operations the rows are sometimes placed as far as 30 inches apart, in order to allow horse tillage. Sometimes the late or winter crop is raised from seed sown broadcast, but this method gives good results only when the soil is well supplied with moisture, very thoroughly tilled beforehand and is free from weeds, since subsequent tillage is impossible. The seeds of Turnips and Rutabagas are of similar size, two or three pounds being required for broadcasting to the acre. When sown in drills one-half or one-third this amount may be sufficient. The yields will sometimes reach 1,000 bushels to the acre, although the average is much less than this.

The Turnip needs no special care as to cultivation. The greatest difficulties are the root maggot, which is the larva of a small fly, and the flea beetle. The maggot may be killed by injecting bisulfide of carbon into the soil about the roots before the grubs have burrowed deeply into the tissues. In general field operations, however, this treatment is impracticable and one must rely on growing the crop in fields which are not infested with the maggot; that is, rotation is the chief recourse. The flea beetle may be kept in check by spraying the plants with Bordeaux mixture, or perhaps better by sprinkling them with Paris green diluted with landplaster (one part by bulk of Paris green to 50 of plaster).

Rutabagas have firmer and richer flesh than the Turnips. They are usually more prized for consumption in winter, and Turnips are usually more popular in the spring and early fall markets. Rutabagas are also more prized for stock-feeding. They yield heavily, are rich and succulent and keep well in any ordinary cellar. Rutabagas started in the middle or last of June in the northern states will reach their full growth by October. They are usually not harvested until heavy frosts have come. The roots of Rutabagas and Turnips sometimes persist through the winter, even though they have been solidly frozen, and send up flower-stalks in the spring; but unlike salsify and parsnips the roots should not be left in the ground to freeze if they are to be used.
L. H. B

TURNIP, INDIAN. *Arisæma triphylla.*

TURNIP-ROOTED CELERY. See *Celeriac.*

TURPENTINE TREE. *Syncarpia latifolia.*

TURPÍNIA (Pierre J. F. Turpin, a French botanist and author). *Celastraceæ.* About 8 species of trees or shrubs from the tropical regions of the world, with opposite abruptly pinnate or rarely simple leaves and small white flowers in spreading terminal or axillary panicles. Fls. hermaphrodite, regular; calyx 5-cut, persistent; petals 5, roundish, sessile; stamens 5: ovary sessile, 3-lobed, 3-loculed: fr. subglobose indehiscent.

argùta, Seem. A tender shrub: lvs. simple, ovate-lanceolate, acuminate, serrate: fls. white, becoming yellowish. China. B.R. 21:1819.—Advertised in S. Calif.
F. W. Barclay.

TURRÆ̀A (Turra, 1607–1688, botanist of Padua, Italy). *Meliàceæ.* About 30 widely scattered species of tropical trees and shrubs with alternate, stalked, entire or lobed lvs. and long white fls. in axillary clusters. Calyx 4–5-toothed or parted; petals 4–5, long and free; staminal tube 4–5-toothed; disk none: ovary 5-, 10- or 20-loculed: ovules 2 in each locule, superposed. *T. heterophylla*, introduced to S. Florida by Reasoner Bros., is probably not in cultivation. It was said to be a native of Natal. The plant described as *T. heterophylla* in Flora Capensis was probably imperfectly diagnosed and should be known as *T. floribunda*, as explained in the Flora of Tropical Africa.

A. *Fls. solitary or in pairs, axillary.*

heterophylla, Sm., not Sonder. Lvs. more or less obovate-cuneate, 3-lobed above, varying to subentire: fls. ½–¾ in. long. Upper Guinea. B.R. 30:4 (as *T. lobata*).—Not cult.

AA. *Fls. clustered at ends of branches.*

floribúnda, Hochst. (*heterophýlla*, Sond.). Shrub: foliage falls away before flowering season: lvs. ovate, acute or produced into a short obtuse point, undivided or 3-lobed: fls. clustered at ends of branches: peduncles and calices silky tomentose. Natal.
W. M.

TURTLE-HEAD. Species of *Chelone.*

TUSSILÀGO (Latin, *tussis*, cough, and *ago;* referring to the medicinal use of the lvs.). *Compósitæ.* Here belongs the Coltsfoot, the flowers of which look much like the dandelion. It resembles the dandelion in having scapes bearing solitary yellow flower-heads composed of rays, but the scapes are scaly and the heads are smaller, lighter colored and borne in early spring before the "main crop" of dandelions. Also the flowers close up in the hot sunshine towards noon, contrary to the custom of dandelions. When the fruit is mature, they hang their heads prettily. The Coltsfoot has a downy head of fruit, but it is not as large, round and attractive as a dandelion's. After the flowers have lost their beauty, the leaves appear. They are heart-shaped and rounded at first, but as they grow they become more and more angled. They are covered with a soft cottony matting which diminishes toward the end of the season. The Coltsfoot is generally considered rather coarse and plebeian, and it is rarely offered for sale, except by collectors of wild plants. It spreads too fast to be a denizen of the flower garden, but it is desirable for wild gardening operations. It grows naturally in moist places and thrives on steep raw banks in the stiffest clay. A mass of its soft, cottony foliage is a pleasant and restful sight in early summer. The variegated form is more commonly cultivated than the type. *Tussilago fragrans*, the "Winter Heliotrope," is a Petasites, which see. The leaves of the Coltsfoot are said to be used in making cigars which are smoked in cases of asthma.

Tussilago is a genus of one species. It is more closely related to Petasites than to Taraxacum. For generic description, see Gray's Manual and Britton and Brown's Illustrated Flora.

Fárfara, Linn. Coltsfoot. Described above. Spreads rapidly by underground stems. Fls. in March. Native to Europe, India and northwestern Asia. Naturalized in America. Gn. 23, p. 113.

Var. **variegàta,** Hort., has lvs. margined and more or less blotched with white or yellow. Gn. 37, p. 435. Lowe 56.
W. M

TUTSAN. *Hypericum Androsæmum.*

TWAYBLADE. *Liparis liliifoliæ.*

TWIN FLOWER. *Linnæa borealis.*

TWIN LEAF. *Jeffersonia.*

TWISTED STALK. *Streptopus.*

TYDÆA. Now included in *Isoloma*.

TŸPHA (ancient name). *Typhàceæ*. CAT-TAIL. REED MACE. A genus of about 10 species of marsh plants with creeping rootstocks and erect, round stems, with long, linear sheathing leaves and monœcious flowers in densely crowded, terminal spikes which are subtended by a fugacious bract.

The following are hardy aquatic or bog perennial herbs of easy culture in wet soil or in water. They spread rapidly and are likely to become too plentiful unless care is taken to pull such of them up as are not wished before they become firmly established. Forms intermediate between the following two species sometimes occur.

A. *Staminate and pistillate spikes contiguous.*

latifòlia, Linn. Fig. 2607. Stem stout, 4–8 ft. high: lvs. wider than in the following species, usually 1 in. wide: pistillate spikes becoming about 1 in. in diam. June, July. N. Amer., Eu., Asia. B.B. 1:62. R.B. 20:196. V. 2:197.

AA. *Staminate and pistillate spikes separated.*

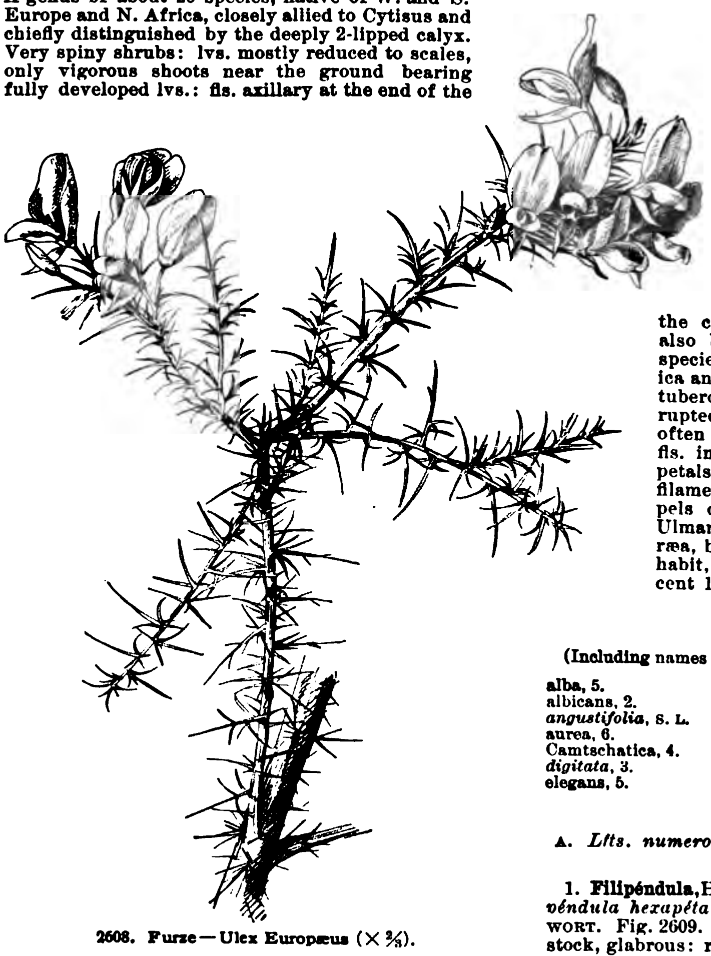
angustifòlia, Linn. Stem more slender than *T. latifolia*, 5–10 ft. high: lvs. usually less than ½ in. wide: spikes usually longer than in *T. latifolia* and much narrower, being about ½ in. in diam. June, July. N. Amer., especially in the east and also Eu. and Asia. B.B. 1:63. G.M. 32:779.

F. W. BARCLAY.

2607. Cat-tail — Typha latifolia.

U

ÙLEX (ancient Latin name of this or a similar plant). *Leguminòsæ.* Furze. Gorse. Whin. Ornamental, much-branched shrubs with dark green spiny branches, usually almost leafless, and showy yellow, papilionaceous flowers which are axillary and often crowded at the ends of the branches. The Furzes are shrubs of various regions and not hardy north, but under protection they survive the winters in New England. They are valuable for covering dry sandy banks and also well suited for seaside planting. On account of their dark green branches they have the appearance of evergreen plants and they are very showy when covered with their yellow flowers. They are also sometimes used for low hedges. They prefer sandy or gravelly porous soil and a sunny position, and should be sown where they are to stand, as they do not bear transplanting well. Prop. by seeds sown in spring or by greenwood cuttings under glass; vars. and rarer kinds also by grafting in spring in the greenhouse on *U. Europæus.* A genus of about 20 species, native of W. and S. Europe and N. Africa, closely allied to Cytisus and chiefly distinguished by the deeply 2-lipped calyx. Very spiny shrubs: lvs. mostly reduced to scales, only vigorous shoots near the ground bearing fully developed lvs.: fls. axillary at the end of the branches; pods small, usually few-seeded. The Furze is sometimes cult. as a winter fodder plant in Europe, the green sprigs of one year's growth being eaten. The fls. yield a yellow dye.



2608. Furze—Ulex Europæus (× ⅔).

Europæus, Linn. Furze. Gorse. Fig. 2608. Much-branched, very spiny and rigid shrub, 2–4 ft. high; branchlets striped, villous when young: lvs. scale-like or narrow lanceolate, pubescent: fls. axillary, 1–3, crowded at the end of the branches and forming racemes; corolla bright yellow, about ¾ in. long, fragrant; calyx yellow, pubescent: pod oblong, ½ in. long, villous, dark brown. April, June and often again in Sept., Oct.; in Calif. almost the whole year. W. and S. Eu. F.S. 5, p. 441 h.—There is a variety with double flowers. None of the other species, which are all more tender, seems to be in the trade in this country.

Alfred Rehder.

ULMÀRIA (derived from *Ulmus;* alluding to the resemblance of the foliage of the common European species to that of the elm). Syn., *Filipéndula. Rosàceæ.* Meadow Sweet. Hardy herbaceous perennials with rather large pinnate or palmately lobed leaves and white, pink or purple flowers in showy terminal corymbs, borne on erect leafy stems rising 1–10 ft. from a rosette of radical leaves. They bloom in early summer or midsummer and are very handsome border plants. Most of them delight in a rather moist and rich soil and are especially decorative if planted on the borders of ponds and brooklets, but *U. Filipendula* prefers drier situations and likes full sun, while most of the others also thrive well in partly shaded positions. *U. purpurea* should be mulched during the winter in the North. Prop. by seeds sown in fall in pans or boxes and kept in the cool greenhouse, or sown in spring; also by division of older plants. Nine species in N. Asia and Himalayas, N. America and Europe. Perennials with fibrous or tuberous rootstock: lvs. stipulate, interruptedly odd-pinnate, the terminal lft. often much larger and palmately lobed: fls. in cymose corymbs; calyx-lobes and petals usually 5; stamens 20–40, with the filaments narrowed toward the base; carpels distinct, 5–15, 1-seeded, indehiscent. Ulmaria has usually been united with Spiræa, but is very distinct in its herbaceous habit, pinnate, stipulate lvs. and indehiscent 1-seeded akenes.

INDEX.

(Including names under Spiræa. s. l.=Supplementary list).

alba, 5.
albicans, 2.
angustifolia, s. l.
aurea, 6.
Camtschatica, 4.
digitata, 3.
elegans, 5.
Filipendula, 1.
flore-pleno, 1, 6.
gigantea, 4.
hexapetala, 1.
lobata, 2.
palmata, 2. 3, 5.
palustris, 6.
pentapetala, 6.
purpurea, 5.
rubra, 2.
Ulmaria, 6.
venusta, 2.
vestita, s. l.

a. *Lfts. numerous, almost alike, small, pinnately lobed.*

1. **Filipéndula,** Hill. (*Spiræa Filipéndula,* Linn. *Filipéndula hexapétala,* Gilib.). Meadow Sweet. Dropwort. Fig. 2609. One to 3 ft. high, with tuberous rootstock, glabrous: radical lvs. 6–20 in. long; lfts. sessile, oblong, pinnately lobed and serrate, 1 in. long: fls. in a loose corymb, white, about ¾ in. across, with usually 6 petals: akenes about 12, pubescent, semi-cordate. June, July. Europe, W. Asia and Siberia.—Var. **flòre plèno** has double flowers, and is common.

AA. *Lfts. few, the terminal one much larger and palmately 3–9-lobed.*

B. *Lateral lfts. 3–5-lobed.*

2. **rùbra,** Hill (*Spiræa lobàta*, Gronov. *Spiræa palmàta*, Linn. *Filipéndula lobàta*, Maxim.). QUEEN OF THE PRAIRIE. Height 2–8 ft., glabrous: terminal lft. large, 7–9-parted, with oblong, acuminate incisely serrate lobes; lateral lfts. smaller, 3–5-lobed, on the upper lvs. missing, green on both sides, only pubescent on the veins beneath: fls. pink, in a rather large paniculate cyme: akenes 6–10, glabrous. June, July. Pa. to Ga., west to Mich. and Ky. Mn. 2:145.—Beautiful. Var. **venùsta,** Hort. Fls. deep pink or carmine. Var. **álbicans,** Hort. Fls. light pink, or almost white. R.B. 3:169.

2609. Ulmaria Filipendula (plant about 2 feet high).

Commonly known as *Spiræa Filipendula*. One of the plants called Meadow Sweet.

3. **palmàta,** Focke (*Spiræa palmàta*, Pall. *Filipéndulæ palmàta*, Max. *Spiræa digitàta*, Willd.). Height 2–3 ft.: lvs. whitish tomentose beneath or glabrous; terminal lfts. 7–9-parted; stipules large, semi-cordate: fls. pale pink at first, changing to white: akenes 5–8. July. Siberia, Kamschatka and Sacchalin.—This species is but rarely cult.; the plant common under the name *Spiræa palmata* belongs to *F. purpurea*.

BB. *Lateral lfts. none, or few and ovate.*

4. **Camtschática,** Rehd. (*Spiræa Camtschática*, Pall. *Spiræa gigantèa*, Hort. *Filipéndula Camschática*, Maxim.). Height 5–10 ft.: lvs. glabrous or villous beneath, often with rufous veins; terminal lft. very large cordate, 3–5-lobed, with broadly ovate, doubly serrate lobes, lateral lfts. usually none; stipules large, semi-cordate: fls. white: akenes usually 5, ciliate. July. Manchuria, Kamschatka.

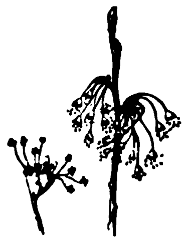
5. **purpùrea,** Rehd. (*Spiræa palmàta*, Thunb. *Filipéndula purpùrea*, Maxim.). Height 2–4 ft., glabrous: terminal lft. very large, cordate, 5–7-lobed, with oblong, acuminate, doubly serrate lobes; lateral lfts. none or few, oblong-ovate; stipules narrow: fls. carmine or deep pink, in large paniculate cymes with crimson peduncles and stems: akenes usually 5, ciliate. June–Aug. Japan. B.M. 5726. I.H. 15:577. F.S. 18:1851. Gn. 17:36.—This is undoubtedly the finest species of this genus. It is also sometimes grown in pots and forced. Var. **álba,** Hort., has white fls. and var. **élegans,** Hort., white fls., with red stamens and usually several lateral lfts.; the latter is said to be a hybrid. R.B. 4:7.

6. **pentapétala,** Gilib. (*U. palùstris*, Moench. *Filipéndula Ulmària*, Maxim. *Spiræa Ulmària*, Linn.). QUEEN OF THE MEADOWS. Height 2–6 ft.: lvs. glabrous and green on both sides or whitish tomentose beneath; terminal lfts. 3–5-lobed, 2–4 in. long, lateral lfts. smaller, ovate, coarsely doubly serrate: fls. white, in rather dense paniculate cymes: akenes about 10, semi-cordate, almost glabrous, twisted. June–Aug. Europe, W. Asia to Mongolia; naturalized in some places in the eastern states. B.B. 2:224.—Var. **aùrea variegàta,** Hort., has the lvs. variegated with yellow. Var. **flòre plèno.** Fls. double.

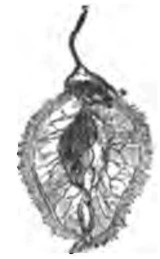
U. ***angustifòlia,*** Rehd. (Spiræa angustifolia, Turcz. Filipendula angustifolia, Maxim.). Similar to F. lobata: fls. white: lvs. glabrous or whitish tomentose beneath. Dahuria, Manchuria.—*F.* ***vestìta,*** Rehd. (Filipendula vestita, Maxim. Spiræa vestita, Wall.). Similar to F. Camtschatica, but only 1 ft. high and lvs. grayish tomentose beneath: fls. white. Himalayas. B.R. 27:4 (as S. Kamschatica, var. Himalensis).

ALFRED REHDER.

ÙLMUS (ancient Latin name of the Elm). *Urticàceæ*, tribe *Ulmeæ*. ELM. Ornamental deciduous, rarely half-evergreen trees, sometimes shrubby, with alternate, short-petioled, serrate lvs. and with inconspicuous, generally greenish brown flowers appearing mostly before the leaves. Most of the cultivated species are hardy north, but *U. crassifolia* and *alata* are tender; *U. parvifolia* and *U. serotina* are of doubtful hardiness, although they have persisted near Boston. The Elms are mostly tall and long-lived trees and very valuable for park planting and for avenue trees, especially *U. Americana*, which is the favorite tree for street planting and as a shade tree for dwelling houses in the northeastern states. It is the most characteristic tree of this region and one of the most beautiful. Its habit is at once majestic and graceful, and the wide-spreading head, borne usually at a considerable height on a straight and shapely trunk, affords ample shade and shelter. Besides the American Elm several other species are used as avenue trees, as *Ulmus fulva*, *racemosa* and the European *U. campestris* and *scabra*. Of *U. campestris*, the vars. *Clemmeri*, *Cornubiensis* and *vegeta* are among the best for street planting; of *U. scabra*, the vars. *Belgica*, *Dovæi* and *Pitteursi*. In the southern states *U. serotina*, *crassifolia* and *alata* are sometimes used as avenue trees. There are several vars. of striking and peculiar habit, as *U. scabra*, var. *fastigiata* and *U. campestris*, var. *monumentalis*, with narrow columnar head; *U. scabra*, var. *horizontalis*, with horizontal limbs forming widespreading tiers; *U. scabra*, var. *pendula*, with long, pendulous branches. *U. campestris*, var. *umbraculifera*, with a dense, globose and rather small head, may be used as an avenue tree for formal gardens. Several species and vars. are interesting in winter on account of their branches being furnished with broad corky wings. The foliage of most species turns pale yellow in fall, but that of the European species remains green much longer.



2610. Flowers of American Elm — Ulmus Americana (× ⅓).



2611. Fruit of Ulmus Americana. (× 2.)

Unfortunately many insects and fungi prey upon the Elm, especially on the American Elm. One of the most destructive is the elm leaf-beetle, *Galleruca xanthomelæna*, which devours the foliage. To keep it from the trees, band the trunks a few feet above the ground with cloth covered with a sticky substance, which prevents the ascent of the wingless female. Spray. A borer, *Saperda tridentata*, sometimes does considerable damage to the wood. The Elms grow best in rich and rather moist soil, and the American Elm especially requires such a soil to attain its full beauty, but some species, as *U. racemosa* and *U. alata*, do well in drier situations. Elm trees are not difficult to transplant, and rather large trees may be moved successfully if the work is done carefully. They bear pruning well, but generally do not need much attention of this kind.

Propagated by seeds ripening usually in May or June and sown at once. Most of the seeds will germinate after a few days, but some remain dormant until the following spring. Increased also by layers, which are usually put down in autumn and are fit to be removed in one year. A moist and rather light soil is best for this method. Trees raised from layers are said to bear seed less early and less profusely and are therefore especially recommended for street trees, as the foliage of trees that fruit slightly or not at all is larger and more abundant. Dwarf forms of *U. campestris* and also *U. parvifolia* and *pumila* may be raised from greenwood cuttings under glass, the cuttings growing most readily if taken from forced plants. *U. campestris* and some of its vars. are also propagated by suckers. In nurseries most of the vars. are propagated by grafting, either by budding in summer or by whip- or splice-grafting in spring outdoors or on potted stock in the greenhouse. *U. Americana*, *campestris* and *scabra* are used for stocks.

About 18 species of Ulmus are known, distributed through the colder and temperate regions of the northern hemisphere, in North America south to southern Mexico, but none west of the Rocky Mts., and in Asia south to the Himalayas. Trees with watery juice: lvs. short-petioled, usually unequal at the base, with caducous stipules: fls. perfect or rarely polygamous, apetalous, in axillary clusters or racemes; calyx campanulate, 4–9-lobed, with an equal number of stamens (Fig. 2610): ovary superior, with a 2-lobed style, usually 1-loculed and with 1 ovule: fr. a slightly compressed dry nutlet, with a broad, rarely narrow membranous wing all around. Figs. 2611–16. The wood is heavy, hard and tough and often difficult to split. It is especially useful in the manufacture of wagon-wheels, agricultural implements and for boat-building. The inner mucilaginous bark of the branches of *U. fulva* is used medicinally and that of some Chinese species is made into meal and used for food. The tough inner bark of some species furnishes a kind of bass which is sometimes woven into a coarse cloth, especially that of *U. campestris*, var. *laciniata*, in Japan.

INDEX.

alata, 4.
alba, 1.
American, 1.
Americana. 1.
Antarctica, 7.
argenteo-variegata, 7.
asplenifolia, 6.
atropurpurea, 6.
aurea, 1.
Belgica, 6.
Berardi, 7.
Camperdowni, 6.
campestris, 7.
carpinifolia, 7.
Cedar, 10.
Chinensis, 9.
ciliata, 2.
Clemmeri, 7.
concavæfolia, 7.
Corky barked, 1, 7.
Cornish, 7.
Cornubiensis, 7.
corylifolia, 7.
crassifolia, 10.
crispa. 6.
cucullata, 7.
Dampieri, 6.
Dovæi, 6.
effusa, 2.
elliptica, 5.
Exoniensis, 6.
fastigiata, 6, 7.
Feathered, 1.
fulva, 5.
glabra, 6, 7.
Guernsey, 7.
Heyderi, 5.
horizontalis, 6.
Japonica, 7.
Koopmanni, 7.
laciniata, 6.
lævis, 2, 7.
latifolia, 7.
Louis Van Houtte, 7.
major, 7.
microphylla, 7, 8.
minor, 7.
montana, 6, 7.
Monumental, 7.
monumentalis, 7.
myrtifolia, 7.
nana, 16.
nitens, 7.
parvifolia, 8, 9.
pedunculata, 2.
pendula, 1, 6, 7, 8.
pinnata-ramosa, 8.
Pitteursi, 6.
pumila, 8.
purpurea, 6.
pyramidalis, 6.
racemosa, 2, 3.
Red, 5.
Rock, 3.
Rosseelsii, 7.
rubra, 5.
Rueppellii, 7.
Sarniensis, 7.
sativa, 7.
scabra, 6.
Scotch, 6.
serotina, 11.
Slippery, 5.
Sibirica, 5, 8.
stricta, 7.
suberosa, 7.
superba, 6.
surculosa, 7.
tricuspis, 6.
tridens, 6.
triserrata, 6.
Turkestanica, 7.
umbraculifera, 7.
vegeta, 7.
viminalis, 7.
vulgaris, 7.
Wahoo, 4.
Water, 1.
Webbiana, 7.
Wheatleyi, 7.
White, 1.
Winged, 4.
Wredei, 6.
Wych, 5.

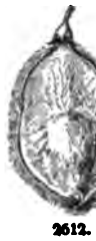
- A. *Blooming in spring, before the lvs.: calyx not divided below the middle.*
  - B. *Fls. on slender pedicels, drooping: fr. ciliate.*
    - C. *Fr. glabrous except the ciliate margin: ' branches without corky wings*.................. 1. **Americana** 2. **pedunculata**
    - CC. *Fr. pubescent: branches often with corky wings* .... 3. **racemosa** 4. **alata**
  - BB. *Fls. short-pediceled in dense clusters, not pendulous.*
    - C. *Buds covered with rusty hairs, obtuse: fr. pubescent in the middle* .... 5. **fulva**
    - CC. *Buds glabrous or pale pubescent: fr. quite glabrous.*
      - D. *Lvs. doubly serrate, very unequal at base*.............. 6. **scabra** 7. **campestris**
      - DD. *Lvs. simply serrate, small, almost equal at the base*... 8. **pumila**
- AA. *Blooming in the axils of this year's lvs. in summer or fall: calyx divided below the middle.*
  - B. *Lvs. simply serrate, small: fr. glabrous*....................... 9. **parvifolia**
  - BB. *Lvs. doubly serrate: fr. pubescent.* 10. **crassifolia** 11. **serotina**

1. **Americàna,** Linn. (*U. álba*, Rafin.). White Elm. Water Elm. American Elm. Figs. 2610, 2611, 2617, 2618. Tall, wide-spreading tree, attaining 120 ft., usually with high, light gray trunk, limbs gradually outward-curving with pendulous branches: branchlets pubescent when young, glabrous in fall: buds acute, glabrous: lvs. obovate-oblong, very unequal at the base, acuminate, doubly serrate, pubescent when young, at length glabrous and rough above, pubescent or almost glabrous beneath, 3–6 in. long: fls. in many-fld. clusters; stamens 7–8, exserted: fr. oval or elliptic, veined, deeply notched, incision reaching to the nutlet. Newfoundland to Fla., west to the base of the Rocky Mts. S.S. 7:311. Em. 2:322. G.F. 3:443, 467; 6:175. Mn. 7, p. 125; 8, p. 71. V. 14:79; 20:10. M.D.G. 1900:392–394.—One of the favorite avenue trees in the northeastern states. The Elm varies considerably in habit, and the following forms have been distinguished. The "vase form": the main trunk separates at 15 to 30 ft. into several almost equal branches, which diverge at first slightly and gradually, but at the height of 50–70 ft. sweep boldly outwards and form a broad, flat head, with the branches drooping at the extremities. This is the most beautiful and also the commonest form. Fig. 2617. The "plume form" is much like the foregoing, but the trunk is less divided and the limbs form few feathery plumes or rarely one. The "weeping-willow form" usually has a rather short trunk with limbs curving outward more rapidly and with long and very slender pendulous branches, forming usually a broad and round head. The "oak-tree form" is distinguished by its limbs spreading abruptly and in sharp turns and the branches being usually less pendulous. The name "Feathery" or "Fringed" Elm is applied to trees which have the limbs and the main trunk clothed with short, somewhat pendent branchlets thrown out usually in clusters at short intervals. This may appear in any of the forms named, but is most conspicuous in trees of the plume form. Fig. 2618. There are a few named varieties in nurseries: Var. **áurea,** Temple, with yellow foliage, found in Vermont by F. L. Temple; var. **nàna,** Hort., a dwarf, compact form, which may perhaps not belong to this species, and var. **péndula,** Ait., with slender pendulous branches.

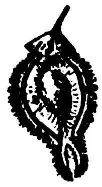
2. **pedunculàta,** Foug. (*U. lævis*, Pall. *U. effùsa*, Willd. *U. ciliàta*, Ehrh. *U. racemòsa*, Borkh., not Thomas). Tree, attaining 100 ft., with spreading branches, forming a broad open head: branchlets pubescent, usually until the second year: buds glabrous, acute: lvs. oval or obovate, very unequal at base, acuminate, sharply doubly serrate, usually glabrous above, pubescent beneath, 2–4 in. long: fls. slender-pediceled; calyx with 6–8 exserted stamens: fr. ovate, notched, the

incision not reaching the nutlet. Middle Europe to western Asia.—Rarely cultivated and with less valuable wood. The trunk and the limbs are, as in the American Elm, often clothed with short branchlets.

3. **racemòsa**, Thomas, not Borkh. Cork Elm. Rock Elm. Fig. 2612. Tree, attaining 100 ft., with short spreading branches, forming an oblong round-topped head: branchlets pubescent usually until the second year and mostly irregularly corky winged when older: buds acute, pubescent: lvs. oval to oblong-obovate, unequal at the base, shortly acuminate, sharply and doubly serrate, glabrous or somewhat rough above, pubescent beneath, 2–4 in. long: fls. in slender pendulous racemes; calyx with 5–8 exserted stamens: fr. oval or obovate, with a shallow notch at the apex, pale, pubescent, ½–¾ in. long. Quebec to Tennessee, west to Nebraska. S.S. 7:312.



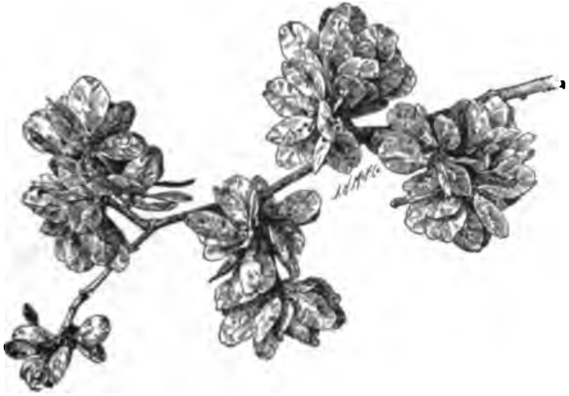
2612. Ulmus racemosa. (× 2.)



2613. Ulmus alata. (× 2.)

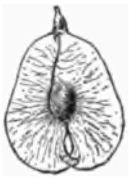
4. **alàta**, Michx. Wahoo or Winged Elm. Fig. 2613. Tree, attaining 50 ft., with spreading branches forming an oblong, round-topped or rather open head: branches usually with 2 opposite very broad wings; branchlets almost glabrous: buds acute, glabrous: lvs. ovate-oblong to oblong-lanceolate, often falcate, acute or acuminate, doubly serrate, subcoriaceous, glabrous above, pubescent beneath, 1½–2½ in. long: fls. in short, few-fld. racemes; stamens usually 5: fr. elliptic-ovate, with narrow wing and with 2 incurved horns at the apex, villous, ½ in. across. Va. to Fla., west to Ill. and Tex. S.S. 7:313.—Handsome round-headed tree, sometimes used as an avenue tree in the southern states; not hardy north.

5. **fùlva**, Michx. (*U. rùbra*, Michx.). Slippery Elm. Red Elm. Figs. 2614, 2615. Tree, attaining 70 ft., with spreading branches, forming usually a broad, open, flat-topped head: branchlets pubescent: lvs. obovate to oblong, very unequal at base, long-acuminate, doubly serrate, of firm texture, very rough above, pubescent beneath, 4–7 in. long: fls. in dense clusters; stamens 5–9: fr. orbicular-oval, little notched at the apex, ½ in. across. Quebec to Fla., west to Dakotas and Tex. S.S. 7:314. Em. 2:334.—The reddish brown pubescence of the bud-scales is very conspicuous in spring, when the buds are unfolding. An allied species similar in foliage and fr. is **U. elliptica**, Koch (*U. Heỳderi*, Späth. *U. Sibìrica*, Hort.), a native of western Siberia, Turkestan and Persia, with longer and larger lvs. and grayish pubescent buds.

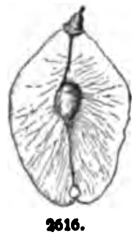


2614. Fruit of Slippery Elm—Ulmus fulva (× ½).

6. **scàbra**, Mill. (*U. montàna*, With. *U. glàbra*, Huds.). Wych Elm. Scotch Elm. Fig. 2616. Tree, attaining 100 ft., with spreading branches forming an oblong or broad round-topped head; without suckers: branchlets pubescent: buds pubescent, rather obtuse: lvs. very short-petioled and unequal at base, broadly obovate to oblong-obovate, abruptly acuminate or sometimes 3-lobed at the apex, sharply and doubly serrate, rough above, pubescent beneath, 3–6 in. long: fls. clustered; stamens 5–6, little exserted: fr. oval or roundish obovate, little notched at the apex, with the seed in the middle, ¾–1 in. long. Europe to Japan.—A variable species of which many forms are cultivated; the following are some of the most important: Var. **atropurpùrea**, Späth. With dark purple foliage. Var. **Bélgica**, Hort. Of vigorous growth, forming a broad pyramidal head; lvs. dark green. Var. **críspa**, Loud. (*U asplenifòlia*, Hort.). A rather slow-growing form with narrow oblong curved lvs. incisely serrate with twisted teeth, giving the margin a fringed appearance. Var. **Dampièri**, Koch. Similar to var. *fastigiata*, but with slender branches, smaller and lighter foliage. Var. **Dampièri Wrèdei**, Hort. Differs from the foregoing by its yellow young leaves. M.D.G. 1898:160. Var. **Dovèi**, Hort. Of vigorous growth and upright pyramidal habit. Var. **fastigiàta**, Loud. (*U. pyramidàlis*, Hort. *U. Exoniénsis*, Hort.). Of columnar habit with strictly upright branches and somewhat twisted, broad dark green leaves. Var. **horizontàlis**, Kirchn. With horizontally spreading limbs and more or less drooping branches. Gn. 17, p. 539. M.D.G. 1901:163. Var. **laciniàta**, Trautv. Lvs. broadly obovate, 3- or sometimes 5-lobed at the wide apex, large, light green: branches little pubescent, light-colored. E. Asia. Var. **nàna**, Hort. Dwarf form. Var. **péndula**, Loud. (*U. Càmperdowni*, Hort.). Camperdown Elm. Fig. 2619. With long pendulous branches, the limbs often spreading horizontally. Gn. 40, p. 158. Var. **Pitteùrsi**, Hort. Pyramidal tree of vigorous growth with deeply serrate lvs. often purplish when unfolding. Var. **purpùrea**, Koch. Lvs. purple when young, changing to dark green. Var. **supérba**, Hort. Of vigorous growth, with large and long, dark green leaves. Var. **tricùspis**, Koch. (*U. triserràta* or *trìdens*, Hort.). Lvs. obovate, 3-lobed at the apex.



2615. Ulmus fulva. (× 2.)



2616. Ulmus scabra. (× 2.)

7. **campéstris**, Smith (*U. suberòsa*, Willd., *U. surculòsa*, Stokes). English Elm. Tree, attaining 100 ft., with spreading branches forming an oblong round-topped or sometimes open head, usually producing suckers: branches little pubescent when young or glabrous, sometimes becoming corky: buds acute, pubescent or glabrous: lvs. distinctly petioled, broadly ovate to ovate-oblong, unequal at the base, acuminate, doubly serrate, usually glabrous and smooth above at length, pubescent or glabrous beneath, 1½–5 in. long: fls. short-pediceled; stamens 4–6: fr. obovate, with the nutlet much above the middle, reaching almost the incision at the apex. Middle Europe and northern Africa to Japan. Em. 2:336. M. D. G. 1900:577. — This tree is often planted as an avenue tree; it succeeds very well and fine old trees may be occasionally seen in the northeastern states. The foliage remains green several weeks longer than that of the American Elm. *U. campestris* is still more variable than the foregoing species and four vars., very distinct in their extreme forms and sometimes considered distinct species, can be distinguished.

2617. One of many natural forms of the American Elm — the vase-form type.

Var. **vulgàris**, Planch. (*U. suberòsa*, Ehrh. *U. minor*, Mill.). Small tree or shrub, with often corky branches: lvs. broadly oval or rhombic obovate, rough above, pubescent beneath, 1–3 in. long: fls. with 5–6 stamens: fr. obovate to oblong-obovate.

Var. **màjor**, Planch. (*U. màjor*, Smith, not Reichb. *U. sativa*, Mill. *U. latifòlia*, Hort.). Large tree: lvs. rather long-petioled, ovate to ovate- or obovate-oblong, usually glabrous and smooth or sometimes slightly rough above, pubescent beneath, 2–5 in. long: fls. with usually 4 stamens; fr. broadly obovate.

2618. A Feathered Elm—Ulmus Americana.

Var. **lævis**, Spach (*U. nitens*, Mönch. *U. glàbra*, Mill., not Huds. *U. carpinifòlia*, Lindl.). Tree without suckers: branches spreading, sometimes pendulous, not corky: lvs. ovate or obovate to obovate-oblong, glabrous and smooth above, glabrous or pubescent only at the veins beneath, 2–4 in. long: fls. distinctly petioled, with 5–6 exserted stamens: fr. obovate.

Var. **Japónica**, Sarg. in herb. Tree, attaining 80 ft.: branches light yellowish gray, covered with short pubescence when young: petioles densely pubescent, ½ in. long: lvs. oblong-obovate, glabrous above, grayish pubescent beneath, 4–6 in. long: fls. almost sessile. Japan. G.F. 6:327.—This form very much resembles the American Elm in habit, foliage and pubescence, but the fls. and fr. are like those of *U. campestris;* it may prove to be a distinct species.

The following are the most important horticultural forms: Var. **Antárctica**, Arb. Kew. Shrub or small tree, with slender often pendulous branches: lvs. slender-petioled, obovate, incisely doubly serrate, somewhat curled, 1–2½ in. long. Var. **Antárctica aùrea**, Hort. (*U. campéstris aùrea*, Morr. *U. Rósseelsii*, Hort.). Similar to the preceding but with yellow lvs. Var. **Berárdi**, Sim.-Louis. Bushy shrub, with slender, upright branches: lvs. oblong to narrow-oblong, with few coarse teeth, ½–1 in. long; it belongs, perhaps, to Zelkowa. Var. **Clémmeri**, Hort. Narrow pyramidal tree with spreading short branches and oval, somewhat rough lvs. Var. **Cornubiénsis**, Loud. (var. *Sarniénsis*, Loud. *U. Whèatleyi*, Hort. *U. stricta*, Lindl.). GUERNSEY ELM. CORNISH ELM. Tree, with short ascending branches forming a dense, narrow pyramid: lvs. rather small, broad, dark green, obtusely serrate. Var. **corylifòlia purpùrea**, Hort. Lvs. large, purplish when unfolding, becoming bright green with reddish petioles, slightly rough above, pubescent beneath. Var. **cucullàta**, Loud. (Var. *concavæfòlia*, Loud.). Lvs. curled, somewhat like a hood. Var. **microphýlla péndula**, Hort. With small lvs. and pendulous branches. Var. **monumentàlis**, Rinz (*U. fastigiàta*, Hort.). MONUMENTAL ELM. Of columnar habit: lvs. rather short-petioled, with broad often almost simple teeth somewhat rough above. Var. **myrtifòlia purpùrea**, Hort., with small broad lvs. purplish when young, dark green later, sharply serrate and somewhat rough above. Var. **péndula**, Hort. With pendulous branches. Var. **Rúeppellii**, Hort. Of compact habit, with corky branches and small foliage. Var. **suberòsa**, Loud. ENGLISH CORKY-BARKED ELM. Branches corky: lvs. rather small and rough above. Var. **suberòsa alàta**, Hort., has very broad corky wings and var. **suberòsa péndula**, Hort., has corky pendulous branches. M.D.G. 1901:166. Var. **umbraculifera**, Späth. Shrub or tree, with slender branches forming a dense, round head: lvs. small, obtusely serrate, rather smooth. M.D.G. 1900:579. Similar forms are *U. Turkestánica*, Hort., and *U. Koòpmanni*, Hort. Var. **vegèta**, Dipp. (*U. montàna*, var. *vegèta*, Loud.). Of vigorous growth, with bright green, large, oblong-obovate lvs., somewhat rough above. Supposed to be a hybrid of *U. campestris*, var. *lævis* and *U. scabra*, and has more the habit of the latter. Var. **viminàlis**, Loud. (*U. scàbra*, var. *viminàlis*, Koch. *U. stricta*, Hort.). Small tree, with slender spreading branches: lvs. elliptic to oblong, incisely serrate, 2–3 in. long. Var. **Webbiàna**, Hort. Lvs. small and broad, somewhat curled, dark green. There are also several variegated vars., of which var. **argenteo-variegàta**, with the lvs. striped and spotted white, and var. **Louis van Houtte**, with yellow foliage, sometimes spotted green, are the most cultivated.

8. **pùmila**, Linn. (*U. microphýlla*, Pers. *U. Sibírica*, Hort.). Small tree or shrub, with slender pubescent, sometimes pendulous branches: lvs. oval-elliptic to elliptic-lanceolate, short-petioled, acute, firm, dark green and smooth above, pubescent when young beneath, ¾–2 in. long: fls. short-pediceled; stamens 4–5, with violet anthers: fr. obovate, with the nutlet somewhat above the middle, incision at the apex reaching about half way to the nutlet. Turkestan to Siberia and N. China.—A graceful small hardy tree. Var. **péndula**, Hort. (*U. parvifòlia péndula*, Hort. *Plánera rèpens*, Hort.), has slender, more pendulous branches. *U. pinnato-ramòsa*, Dieck, with the slender branches very regularly pinnately branched, is probably only a form of this species.

9. **parvifòlia**, Jacq. (*U. Chinénsis*, Pers.). CHINESE ELM. Half-evergreen small tree or shrub, with spreading pubescent branches: lvs. ovate to obovate or oblong, very short-petioled and little unequal at base, acute or obtusish, subcoriaceous, glabrous and glossy above, pubescent beneath when young, usually glabrous at length, ¾–2 in. long: fls. short-pediceled in clusters; stamens 4–5, much exserted: fr. oval to elliptic, notched at the apex, with the seed in the middle, ⅛–½ in. long. July–Sept. N. China, Japan.—Has proved hardy near Boston.

10. **crassifòlia**, Nutt. CEDAR ELM. Tree, attaining 80 ft., with spreading limbs and slender, often pendulous branches, often furnished when older with 2 opposite corky wings: lvs. short-petioled, ovate to ovate-oblong, usually very unequal at the base, obtuse or acute, doubly and obtusely, sometimes almost simply serrate, subcoriaceous, somewhat rough and lustrous above, pubescent beneath, 1–2 in. long: fls. in few-fld. very short racemes; stamens 5–8, little exserted: fr. oval-elliptic, pubescent, notched, ⅓ in. long. Aug. Miss. to Ark. and Tex. S.S. 7:315.—Tender north.

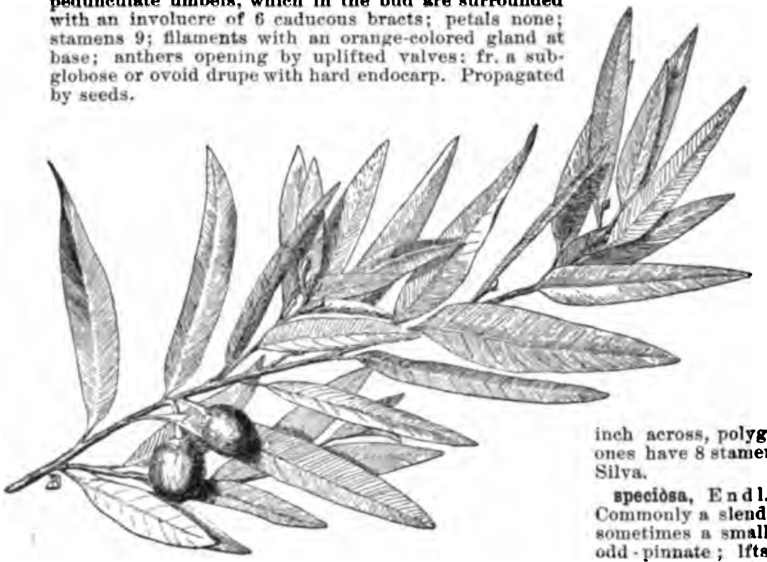
2619. Camperdown Elm—Ulmus scabra, var. pendula.

11. **serótina**, Sarg. Tree, with short spreading and pendulous branches, often furnished with irregular corky wings: lvs. oblong to obovate, unequal at the base, acuminate, doubly serrate, glabrous and lustrous above, pubescent on the veins beneath, 2–3 in. long: fls.

in ½-1 in. long pendulous racemes; calyx 5-6-parted to the base: fr. elliptic, deeply notched, densely ciliate, ½ in. long. Sept. Tenn. to Ga.; sometimes planted in avenues in Ga.; has proved hardy at the Arnold Arboretum, Boston.

U. Kèaki, Sieb.=Zelkova Keaki.—*U. Verschaffèltii*. Hort.=Zelkova Japonica, var. Verschaffeltii. ALFRED REHDER.

UMBELLULÀRIA (from Latin *umbella*, a sunshade; having reference to the form of the inflorescence). *Lauràceæ*. CALIFORNIA LAUREL. A monotypic genus, comprising a single Pacific coast tree with alternate, simple, exstipulate lvs.: fls. small, greenish, in simple pedunculate umbels, which in the bud are surrounded with an involucre of 6 caducous bracts; petals none; stamens 9; filaments with an orange-colored gland at base; anthers opening by uplifted valves: fr. a subglobose or ovoid drupe with hard endocarp. Propagated by seeds.



2620. California Laurel—Umbellularia Californica (× ⅓).

Califórnica, Nutt. (*Oreodáphne Califórnica*, Nees). Fig. 2620. Handsome evergreen tree, 20 to 30 or even 80 to 90 ft. high, with erect or suberect slender branches, conical outline and dense foliage: lvs. containing a highly aromatic and volatile essential oil, and burning vigorously in the camp fire, even while green: fls. fragrant: drupes at first yellowish green, becoming purple when ripe. Dec. to May.—One of the most abundant and characteristic of Californian trees, common in moist places, particularly along streams in the Coast Range foothills and mountains, and attaining its greatest size in the cool, fog-moistened alluvial valleys of the coast of northern California and southern Oregon; it is but rarely seen in the drier interior valleys of the state. It often crowns the highest points of the coast range hills, up to about 2,500 feet altitude and far from the nearest spring or other visible sign of moisture, but in such cases the rock strata are nearly vertical and easily penetrated by the long roots which are able thus to reach hidden supplies of water. In such places it usually forms dense clumps or thickets of shrubs or small trees which are frequently shorn by the cutting ocean winds as though by a gardener's shears, suggesting its adaptability for clipped-hedge and wind-break work. The wood takes a beautiful polish and is considered "the most valuable wood produced in the forests of Pacific North America, for the interior finish of houses and furniture," for which purposes it is extensively used. It is also used in boat-building for jaws, bits, cleats, cross-trees, etc. The branches are occasionally used for poles for chicken-roosts, as the strong odor, pervading wood and bark as well as leaves, is said to keep away lice. The leaves are used for flavoring soups and blancmanges but are too strong to give as agreeable a flavor as those of *Laurus nobilis* or *Prunus Laurocerasus*. The tree is sometimes cultivated for ornament in south European parks and gardens. Professor Sargent describes it as "one of the stateliest and most beautiful inhabitants of the North American forests, and no evergreen tree of temperate regions surpasses it in the beauty of its dark dense crown of lustrous foliage and in the massiveness of habit which make it one of the most striking features of the California landscape and fit it to stand in any park or garden."

JOSEPH BURTT DAVY.

UMBRELLA LEAF. See *Diphylleia*.

UMBRELLA PINE. *Sciadopitys*.

UMBRELLA PLANT or **UMBRELLA PALM.** *Cyperus alternifolius*.

UNGNÀDIA (Baron Ungnad, ambassador of Emperor Rudolph II to the Ottoman Porte, who in the year 1576 introduced the common horse chestnut to western Europe by sending seeds to Clusius at Vienna). *Sapindàceæ*. A genus of one species, the MEXICAN BUCKEYE, a small tree closely related to the horse chestnut but with foliage like a hickory, the lvs. being alternate and pinnate, and rose-colored fls. which are borne in small lateral clusters or simple corymbs, appearing with the lvs. in early spring. The seed, or "bean," has a sweet taste, but is considered emetic and poisonous. The fruit does not have a prickly husk like the horse chestnut; it is a smooth, leathery capsule and strongly 3-lobed. The fls. are about ⅜ of an inch across, polygamous, 4-petaled, and the staminate ones have 8 stamens. For fuller account, see Sargent's Silva.

speciòsa, Endl. SPANISH or MEXICAN BUCKEYE. Commonly a slender deciduous shrub, 5-10 ft. high or sometimes a small tree: wood brittle: lvs. alternate, odd-pinnate; lfts. 5-7, ovate-lanceolate, acuminate. Common in southwest Texas; winter-kills in northern Texas at a temperature of zero. S.S. 2:73. F.S. 10:1039. Gn. 19, p. 309.—Int. by P. J. Berckmans.

W. M.

UNICORN PLANT. *Martynia proboscidea*.

UNÌOLA (an ancient Latin name of some unknown plant, derived from *unus*, one, and said to have been applied by Linnæus to this genus on account of the union of the glumes). *Gramineæ*. Perennials with creeping rootstocks. Species 5, all American. Spikelets broad and very flat, in loose panicles, several fld., with some of the lower glumes empty; glumes keeled, nerved, pointed, but awnless. Cultivated for the ornamental panicles, which are suitable for dry bouquets.

latifòlia, Michx. SPIKE-GRASS. Fig. 2621. Culms 2-4 ft.: lvs. broad and flat, often 1 in. wide: spikelets large and thin, at maturity drooping on slender pedicels, forming a very graceful and ornamental panicle. Pa. to Kan. and southward.—Often grown in hardy borders. One of the best of our hardy native, perennial grasses.

paniculàta, Linn. SEA OATS. Culm taller, 4-8 ft.: lvs. narrow and convolute: spikelets narrower, upright on short pedicels, forming an elongated panicle. Sandhills along the seashore of the southern states.

A. S. HITCHCOCK.

URÀRIA (Greek *oura*, tail, referring to bracts). *Leguminòsæ*. Eight species of perennial herbs with woody bases, all of which are accounted for in the Flora of British India. They have 1-9 lfts. and very numerous, small or minute fls. in racemes. Standard broad: wings adhering to the obtuse keel; stamens diadelphous: ovary sessile or short-stalked, few-ovuled: style inflexed: pod of 2-6 small, turgid, 1-seeded, indehiscent joints, often placed face to face.

The following species is the most desirable of the genus. It grows about 5 ft. high and is crowned by a single terminal raceme sometimes 2 ft. long, densely crowded with 200 or more pea-shaped fls. each ½ in. long. In the Flora of British India this plant is erroneously said to ascend the Himalayas to an altitude of 9,000 ft. A corrected account of this plant is found in B.M. 7377, from which source one infers that the plant is not hardy. The first plants flowered in Europe bloomed in September and the annual stems then died down to the base. Seeds of this plant have been imported by a northern amateur who has a winter home in Florida.

crinita, Desv. Erect, little-branched, subshrubby perennial, 3–6 ft. high, distinguished from other species by having its upper lvs. composed of 3–7 oblong lfts. and pedicels clothed with long bristles. Lfts. 4–6 x 1½–2 in.: racemes dense, 1 ft. long, 1–1½ in. thick; standard ovate, violet-purple within, pale blue outside: wings pinkish. Bengal to Assam, eastward through Burma to China, south to Malacca and the Malay Islands to Timor Laut, but not Australia and not indigenous in Ceylon. B.M. 7377. W. M.

2621. Uniola latifolia (× ¼). (See page 1883.)

URCEÓCHARIS (hybrid name, suggesting that the plant is a hybrid between Urceolina and Eucharis). *Amaryllidàceæ.* The only species, *Urceocharis Clibrani* (see Fig. 2622) is a tender winter-blooming bulbous plant with broad lvs. a foot long and half as wide and large, white, bell-shaped, 6-lobed flowers, a dozen or so in an umbel, and each 2 in. across. The plant is a hybrid, introduced about 1892, between *Urceolina pendula* and *Eucharis grandiflora*, or in gardener's language *Urceolina aurea* and *Eucharis Amazonica*. A flower of the hybrid and of each of its parents is shown in Fig. 2622. The hybrid gets its white color from Eucharis, the flowers of Urceolina being yellow. The shape of its flower is so singular a mixture of the two as to be very different in appearance from either. The hybrid lacks the beautiful staminal cup of Eucharis, and has a distinctly bell-shaped perianth. The showy part of Urceolina is the urn-shaped portion of the flower, the spreading tips being very short. The perianth of Eucharis is funnelform, the spreading portion being large and showy. The perianth-tube and ovary of the hybrid are like those of Urceolina, the ovary being deeply 3-lobed instead of globose as in Eucharis. The pedicels are ascending, as in Eucharis, not pendulous as in Urceolina. The appendages at the base of the stamens are more distinctly marked than in either of the parents.

The parents of Urceocharis belong to the Pancratium tribe, characterized by having the stamens appendaged toward the base and often united into a distinct cup. Twelve of the 17 genera in this tribe are from the Andes and 8 of these, including Eucharis and Urceolina, have broad and petioled lvs. and the ovules are superposed. Eucharis and Urceolina have a long, slender tube which is suddenly swollen above. The flowers of Eucharis are white and those of Urceolina colored, but the essential difference between the two genera lies in the stamens, which are minutely appendaged in Urceolina, while in Eucharis they are quadrate and sometimes united to make a cup.

This bigeneric hybrid was introduced to the trade under the name of *Eucharis Clibrani*, but the changes wrought in the structure of the flower by the cross are so great that Dr. Masters was justified in giving the plant a new genus.

Clibrani, Mast. (*Eùcharis Clìbrani*, Hort.). Tender bulbous hybrid of *Urceolina pendula* and *Eucharis grandiflora*, with petioled lvs. 1 x 1½ ft. and umbels of white bell-shaped 6-lobed fls. each 2 in. across and a dozen in an umbel. Anthers depauperate. Blooms in early winter. For culture, see *Urceolina*. G.C. III. 12:215; 26:251. Gn. 44, p. 459. G.M. 35:790.—Int. about 1892 by Messrs. Clibran, Oldfield Nurseries, Altrincham, England. W. M.

URCEOLÌNA (Latin, *pitcher;* alluding to the pitcher- or urn-shaped flowers). *Amaryllidàceæ.* A genus of 3 species of South American bulbous herbs, with thin oblong to long-lanceolate, petioled leaves and a naked scape bearing an umbel of pendulous red or yellow flowers. Perianth-tube often narrow and often somewhat stem-like at the base, suddenly dilated; stamens inserted at or below the throat of the tube, indistinctly appendiculate at the base.

The species of Urceolina are attractive plants and easily grown, flowering every year, but for some reason they are rather scarce. The bulbs are about 3 in. across and during the growing season have 1 or 2 lvs. The plants flower in December. After flowering the bulbs may be removed from the stove to the intermediate house and placed in a spot where they will be kept dry. Just before growth begins in the spring the bulbs should be taken out of the pots and the exhausted soil removed. The bulbs may then be replaced, one bulb in a 5-in. pot, using clean pots, plenty of drainage material and a rich, light, porous soil. Place the top of the bulb level with the soil. Remove the pots to the stove, and as soon as growth begins water freely. In the fall when the lvs. turn yellow, water sparingly and finally withhold water altogether. The flower scapes appear a few weeks after the lvs. disappear.

A. *Fls. red.*

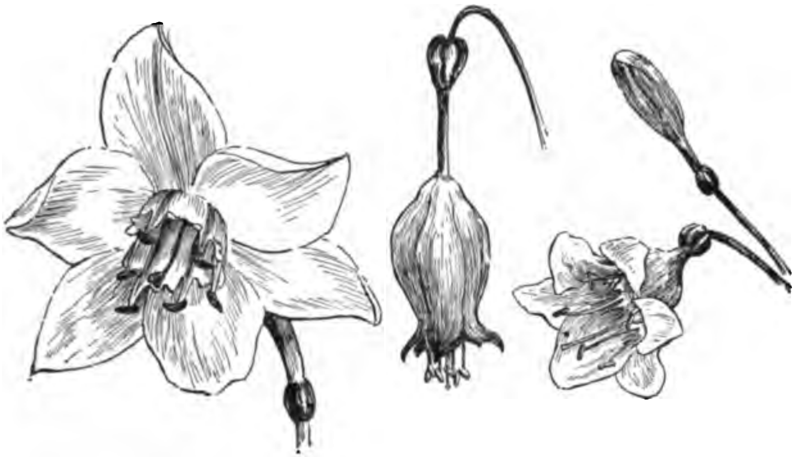
miniàta, Benth. & Hook. (*Pentlándia miniàta*, Herb.). Bulb about 1½ in. through: lvs. produced after the fls., short-petioled, about 1 ft. long, 1½ in. wide, narrowed at both ends: scape over 1 ft. long: fls. 2–6, bright scarlet. Andes of Peru and Bolivia. B.R. 25:68. R.B. 23:49.—Offered by Dutch bulb-growers.

AA. *Fls. yellow.*

péndula, Herb. (*U. aùrea*, Lindl.). Bulb about 1½ in. through: lvs. 1–2 to a stem produced after the fls., oblong, acute, 1 ft. long by 4–5 in. broad: scape about 1 ft. long: fls. 4–6, bright yellow tipped with green. Andes of Peru. B.M. 5464. G.C. III. 12:211.

F. W. BARCLAY and ROBERT CAMERON.

URÈRA (meaning not obvious). *Urticàceæ*. About 18 species of shrubs and small trees, rarely subshrubs, native to tropical regions, with alternate lvs., entire or variously cut, palmately or pinnately nerved, and numerous small fls. borne in cymes which are often repeatedly forked. DC. Prod. vol. 16, part 1, pp. 88–98 (1869). The following has been offered in America as an ornamental greenhouse shrub.



2622. At the left, Eucharis grandiflora; next, Urceolina pendula; at the right, the hybrid Urceocharis Clibrani. All half size.

alceæfòlia, Gaud. (*Urtica Caracasàna*, Jacq.). Tree or shrub: lvs. broadly ovate, acuminate, basal sinus wide and open, crenate-dentate: fls. diœcious, in regularly dichotomous cymes; male cymes 4–6 times dichotomous, stinging or not, rose-colored: female fls. many times dichotomous, the fls. solitary or in 3's. Trop. America. W. M.

URGÌNEA (from the name of an Arabian tribe in Algeria). *Liliàceæ*. The SEA ONION, known to drug stores by the name of Squill, and to gardens as *Urginea maritima*, is a bulbous plant native to the Mediterranean region, which grows 2 or 3 ft. high and has a long raceme of small, whitish, 6-parted flowers. The raceme is often 1½ ft. long and contains 50–100 or more fls. each ½ in. across. It has the same style of beauty as *Ornithogalum pyramidale* but unfortunately it is only half-hardy. As an ornamental plant it is little known in America. The name seems not to appear in American catalogues, but the Dutch bulb-growers offer the bulbs in at least 5 sizes. A plant erroneously called Sea Onion is *Ornithogalum caudatum*. There is considerable difference of opinion as to when the Sea Onion blooms, but the plant is generally considered an autumn bloomer, and it is clear that the leaves appear after the flowers. In England the plant is said to have flowered as early as July and August. Baker writes that the lvs. appear in winter. Some English cultivators say the lvs. appear as early as October and November; others say not until spring. The plant grows near the seashore and inland, in dry sandy places from the Canaries to Syria. It is also found in South Africa, which is unusual, as the North and South African species of any genus are not usually identical.

The proper name of the Sea Onion is *Urginea Scilla*. The plant is closely related to the genus Scilla, but in the opinion of the undersigned it is much closer to Ornithogalum, especially in habit, inflorescence and color of flowers. The seeds of Urginea are numerous in each locule (in the Sea Onion 10–12), strongly compressed and winged; in Ornithogalum and Scilla they are not compressed or winged and in Scilla they are solitary or few in each locule. Urginea is a genus of 40 species of bulbous plants native to the eastern hemisphere. Typically, the species have narrow or lorate lvs. which follow the fls., and racemes of numerous whitish, rarely pale yellow or rosy fls., each segment of which is keeled with green or purplish. Monographed by J. G. Baker in Latin in Journ. Linn. Soc. 13:215 (1873). At that time Baker recognized a total of 24 species, but in Flora Capensis 6:462 (1896–97) he describes 27 species from South Africa alone.

The bulbs of Urginea are collected in large quantities in the Mediterranean region for the drug trade. They sometimes attain a maximum weight of 15 pounds. The bulbs contain about 22 per cent of sugar and are used in Sicily in the manufacture of whiskey. Squills have emetic and cathartic properties. Syrup of squills is a popular croup medicine. The bulb, as it appears in the wholesale drug market, has been deprived of its outer scales and cut into thin slices, the central portions being rejected.

Scílla, Steinh. (*U. marítima*, Baker). SEA ONION. SQUILL. Height 1–3 ft.: bulb 4–6 in. thick: lvs. appearing after the fls., lanceolate, somewhat fleshy and glaucous, glabrous, 1–1½ ft. long, 2–4 in. wide above middle: racemes 1–1½ ft. long, 1–1½ in. wide, 50–100-fld.: fls. ½ in. across, whitish, with the oblong segments keeled greenish purple. Autumn. Canaries to Syria, S. Africa. B.M. 918 (as *Ornithogalum Squilla*). W. M.

URSÌNIA (John Ursinus, of Regensburg, 1608–1666; author of "Arboretum Biblicum"). *Compósitæ*. Here belongs the hardy annual known to the trade as *Sphenogyne speciosa*. It grows about a foot high, has finely cut foliage and yellow or orange flower-heads 1½–2 in. across. The heads have about 22 rays. Both yellow and orange-colored flowers are sometimes found on the same plant. When well managed it blooms all summer. It is supposed to be a native of the Cape. It has been in cultivation since 1836 but was not correctly described until 1887. It is much praised by connoisseurs, though it is not known to the general public. It seems to have enjoyed a longer continuous period of cultivation than many other showy composites, in which the Cape is wonderfully rich, particularly in subshrubby kinds. In Flora Capensis, vol. 3 (1864–65), Sphenogyne and Ursinia are treated as separate genera, the distinctions being as follows: the akene is cylindrical in Sphenogyne, but obovate or pear-shaped in Ursinia, distinctly tapering to the base: the pappus is uniseriate in the former, biseriate in the latter, the inner series consisting of 5 slender white bristles. In the course of time these distinctions have been dropped and Sphenogyne included in Ursinia.

Ursinia is a genus of about 60 species, all native to S. Africa. One species, *U. annua*, is also found in Abyssinia. The species are annuals, perennials or subshrubs: lvs. alternate, serrate, pinnatifid or usually pinnatisect: rays the same color on both sides or purplish brown beneath: involucre hemispherical or broadly campanulate: akenes often 10-ribbed. For further particulars, see Flora Capensis, vol. 3. There are said to be many other desirable species besides the following:

púlchra, N. E. Br. (*Sphenógyne speciòsa*, Knowles & Westc.). Annual, 1–2 ft. high. with lvs. bipinnately

dissected into linear lobes and yellow or orange fl.-heads 2 in. across: rays about 22, 3-toothed, spotted purple-brown at base: stem glabrous, branched: lvs. alternate: scapes nearly leafless, about five times as long as lvs.: involucre 4-rowed; scales increasing in size from the base, outer rows with a brown scarious border, inner with a white scarious border. F.C. 2:77. P.M. 6:77. G.C. III. 4:356. Gn. 44, p. 217. R.H. 1843:445.
W. M.

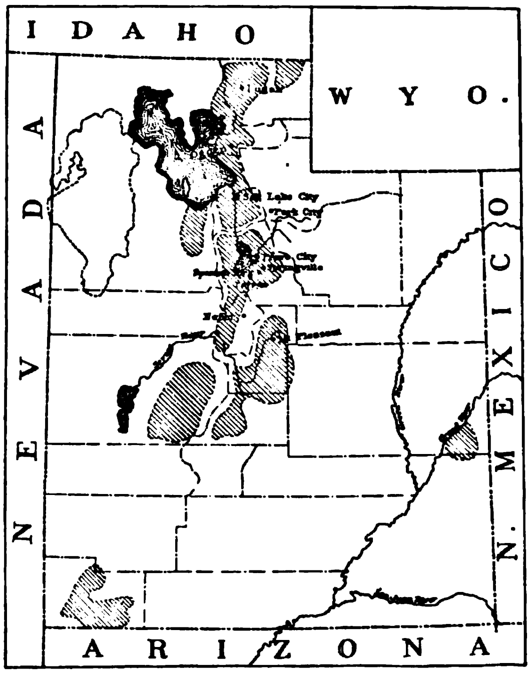
ÚRTICA (*Urticaceæ*) is the genus containing the nettles. For *U. Caracasana*, see *Urera*. *U. nivea* is Ramie or Silver China Grass, properly *Bœhmeria nivea*, which see. As Ramie is a fiber plant, not a horticultural subject, it is not fully treated here, the student being referred to the publication of the office of Fiber Investigations, U. S. Dept. Agric., Washington, D. C.

UTAH, HORTICULTURE IN. Fig. 2623. While the area in Utah devoted to fruit-growing is very small compared to the area of the whole state, there are few states in the Union which surpass Utah in the number of kinds grown. Beginning in the northern part of the state, in the vicinity of the agricultural college at Logan, the fruits of the cooler temperate regions flourish, most varieties of apples and pears succeeding well, many sorts of plums and cherries thriving and even the hardier peaches giving a fair number of crops as compared to the years of failure. The chief difficulties here are, first, the short season, which does not admit of the ripening of fruits that require more time for their development than the Concord grape, for example, and second, the great liability to late spring and early autumn frosts.

Throughout the entire state the annual rainfall is very light, and what little precipitation there is falls for the most part during the winter season in the form of snow, so that practically no fruit is grown within the borders of the state without irrigation, and this is a factor which determines to a very great extent the sections and even the particular localities devoted to fruit-growing. The conditions in the Cache valley illustrate this point. This region is a mountain valley lying in the heart of the Wasatch range of the Rocky Mountains in the northern part of the state, and is some 60 miles long by 12–18 miles wide. The soil of this entire valley, with the exception of a few alkali areas and some boggy districts, is well suited to fruit-growing, but the rivers which furnish the water for irrigating all enter the valley from the eastern side, and as the land slopes from both sides to the center of the valley it is impossible to conduct the water on to much land that might otherwise be profitably used for fruit. Artesian wells supply water to some lands to which the river waters cannot be brought, but here again the difficulty is that comparatively few sections of the state are blessed with the possibility of having artesian wells.

The earlier Mormon settlers of the state inaugurated a system of irrigating canals, which, considering the means at their command, were wonderfully effective. More recently, the Bear River Canal Company of the northern part of the state and several other large corporations have expended great sums of money in putting in dams and digging canals, by means of which large areas of land which had previously grown nothing but a good quality of sage-brush have been changed into good farms. In order to increase the sale of these lands many orchards have been set. These operations have served as a wonderful stimulus to the fruit-growing industry.

In all the northern portions of the state where late frosts are likely to occur and injure the fruit crop, what are known as the "cañon winds," become very important factors in the success of fruit plantations. These winds begin blowing daily about eight o'clock in the evening and continue all night and until six to nine o'clock the next morning. They are almost as regular as clockwork. They come from the cañons and blow with such force as to necessitate thick wind-breaks to protect all orchards within a mile or two of the cañon's mouth. But gradually they spread out over the lower lands in a fan-shaped area, their force lessening as the distance from the cañon increases, though still sufficiently strong to prevent the cold air from settling and producing frost. So marked is their influence upon the occurrence of frosts that it is no uncommon thing after a cold night in the spring or autumn to find that while the plantations in the districts influenced by the cañon winds have come through without injury, yet just around a spur of the mountain out of reach of the wind, the blossoms have nearly all been injured. Perhaps in time satisfactory varieties may be developed which will bloom late enough to avoid this danger, but as yet the problem of frosts is even more difficult to solve than that of water.



2623. Map of Utah.

Shaded parts show horticultural areas.

Another factor which has contributed in the past toward restricting the areas devoted to fruit is the manner in which the early settlements in the state were located. The pioneers settled in villages, each man being allotted a small piece of land on which the home was built and the garden and small family orchard established. Then on the outskirts of this village, and extending sometimes as far as ten miles from it, were located the farms proper, which were allotted to the residents of the village, so that even in what may be called the strictly farming districts of the state the people lived in villages and drove out to cultivate their farms. Naturally the fruit plantations which needed the personal and constant oversight of the owner to insure a crop or at least a harvest, were confined to the plantation in the village and the farm was given over to grains and hay crops. It is only in the comparatively few districts where the village system did not obtain, or within more recent years when it has been somewhat abandoned, that the larger available areas of the farms have encouraged the planting of larger orchards.

So far as most insect pests are concerned, the Utah fruit-grower is neither more nor less fortunate than his brothers of other states. It is true there was a time when the somewhat isolated position of the state seemed to warrant the belief that it would escape from the inroads of many of the pests which troubled growers elsewhere, but with the advent of better transportation facilities and the increase of fruit plantations, the standard insect enemies have one after another entered the borders of the state. But, on the other hand, in the matter of fungous diseases the state is singularly fortunate, there being in most sections comparatively little trouble from them. Doubtless the dry atmosphere of Utah is responsible for this.

It seems probable that the state will never enjoy a large local market, though the mining industry will insure a fair one, but its mountain climate seems to give a superior quality to the fruit grown and with the more general adoption of better methods there is no reason why fruit-growing in Utah should not take its place as one of the chief branches of the agriculture of the state. F. C. Sears.

Another View of Utah.— In Cache valley, apples, pears, American plums and sour cherries do exceedingly well. Peaches are grown there in a small way. The temperature in winter is often lower than 20° below zero, and that, together with late frosts, is the reason of the failure of the peach crop. In 1899–1900 the lowest temperature was 10° below zero, and the following winter the lowest temperature was about 2° below zero, and each of these winters was followed by a full crop of peaches.

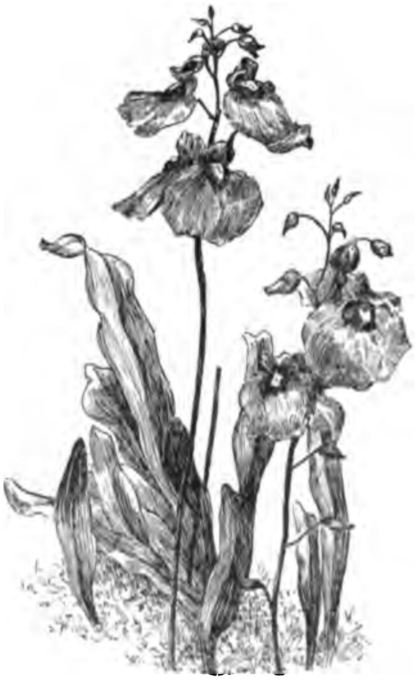
In the valley next south of Cache valley, peaches and apricots are grown very successfully at Brigham City. At Ogden there are a few of the European grapes, but they are protected during the winter by being laid down and covered with earth. Even with this protection the vines are badly damaged by freezing, as is indicated by large, corky swellings often called black knot of the grape. Sweet cherries and native grapes do very well in certain localities in this section. There are a few hardy almond trees near Ogden. Farther south, at Provo, there is at least one vineyard of Vinifera grapes in which the vines are pruned similar to the Californian system, except that the trunks are only a few inches high. These vines are protected with a covering of earth during the winter. Apples and pears do very well from Cache valley in the north, through the portions mentioned above, to Provo, and for some distance farther south. It is very probable that all hardiest varieties of apples and pears would do well in Beaver, Iron and Sevier counties, but as yet very little has been done with them because of the long and extremely cold winters. In many portions of these counties the elevation is 6,000 feet.

The climate of Washington county, in the southwestern corner of the state, is very mild, but is not so mild as that of most of southern California. The temperature in winter occasionally reaches zero. Vinifera grapes, figs, pomegranate and almonds grow there successfully without artificial protection. No attempt is made to grow oranges and lemons. Peaches and apricots grow to perfection in this region when any attention is given to the trees. This section was Utah's most noted fruit district from ten to twenty years ago, but so little care has been given to fruit trees that the orchards have gone to ruin. At present the principal occupation there is the growing of alfalfa and stock, but the improved methods of fruit-growing will probably be practiced soon. For further notes on fruit-growing in Utah, see Hedrick, Proc. Amer. Pomological Society, session of 1899, p. 225. C. P. Close.

UTRICULÀRIA (Latin, *a little bag* or *skin;* referring to the bladders). *Lentibulariaceæ.* Bladderwort. Utricularia is a genus of herbaceous plants possessing little bladders which trap small aquatic animals. The bladders have a valve-like door through which the animals enter when looking for food or when trying to escape from other creatures. The bladders are most numerous and effective in the species which float in stagnant water. They are fewer in the marsh-inhabiting species. The terrestrial kinds often have minute, deformed and useless bladders. The aquatic species are characterized by much dissected lvs. with thread-like segments, a type of foliage seen in the water crowfoot and other floating plants of widely different families. They are quite devoid of roots. The terrestrial kinds are common in the tropics and are characterized by erect foliage of the ordinary type. These often form little tubers by which they may be propagated. Our native aquatic species propagate themselves by seeds and also by winter-buds. (A winter-bud of another aquatic plant is figured under *Elodea*, p. 528).

The aquatic species are sometimes cultivated in aquaria, but their flowers are not showy, nor are those of any of the hardy kinds. The showy species are the terrestrial and epiphytic kinds of the tropics. These, for complexity of floral structure, beauty of color and lasting qualities, vie with certain orchids. In fact, they are generally grown by orchid lovers in orchid houses. Perhaps the most desirable of the genus are *U. montana*, *Endresii* and *longifolia*, each of which represents a different color. Well-grown baskets of these plants have numerous scapes a foot or so high bearing 5–20 fls., each 1½-2 in. across. In general, such plants are grown in warm houses, *U. Endresii* requiring a stove temperature, while some of the others may thrive in an intermediate house. As a class they are grown in baskets, near the light, using a compost of fibrous peat and sand. The plants are kept constantly wet during the growing season and until the fls. are gone. During the winter they are rested, being kept in a cooler place and given just enough water to keep the tubers from shriveling.

The epiphytic species deserve a word. Those who are familiar with bromeliaceous plants know how the water gathers in the axils of the leaves. These bromeliads are themselves often epiphytic, perching on high trees in moisture-laden tropical jungles. In the miniature ponds supplied by the leaf-axils of Vriesia and other bromeliads live certain Utricularias with fully developed and effective bladders. Occasionally they send out a long "feeler" or runner-like shoot which finds another bromeliad and propagates another Bladderwort.



2624. Utricularia longifolia (× ¼).

Utricularias have numerous slender, wiry scapes bearing one or many flowers. Calyx large, 2-parted or 2-lobed: corolla with a spur which is usually long and curved under the fl.; posterior lip erect, entire, emarginate or 2-fid: anterior lip often large, broad and showy, spreading or reflexed, entire, crenate or 3-lobed, or the middle lobe various. About 150 species.

A. *Habit aquatic: foliage dissected into numerous thread-like segments: lvs. floating*.............................. **vulgaris**
AA. *Habit terrestrial or epiphytic: foliage entire, erect.*
  B. *Color of fls. white, with a yellow palate*.............................. **montana**
  BB. *Color of fls. yellow, with an orange palate*.............................. **bifida**
  BB. *Color of fls. purple, violet or lilac, with a yellow palate.*
    B. *Lvs. broader than long.*
      C. *Shape of lvs. reniform.*
        D. *Fls. pale blue or lilac*........... **janthina**
        DD. *Fls. rose-colored* .... **reniformis**
      CC. *Shape of lvs. obcordate*............ **Humboldtii**
    BB. *Lvs. long and narrow, linear, oblong or lanceolate.*
      C. *Fls. pale lilac* .... **Endresii**
      CC. *Fls. violet-purple*................. **longifolia**

vulgàris, Linn. Hardy native aquatic plant, with crowded, 2–3-pinnately divided floating lvs. ½ in. long, provided with numerous bladders and yellow fls. ½ in. long or more, borne in 3–20-fld. racemes. June–Aug. Brooks and ponds, Eu., Asia, N. Amer. B.B. 3:191. Gn. 28, p. 403.—Advertised by American aquatic specialists and collectors of native plants.

montàna, Poir. Tropical American epiphyte, with clusters of tubers ⅛–½ in. long, minute, deformed, useless bladders and large white fls. with a yellow palate, the fls. 1–4 on a scape, each 1½ in. across. Lvs. 4–6 in. long, elliptic-lanceolate. Trunks of trees, West Indies and S. Amer. B.M. 5923. F.S. 19:1942. I.H. 18:64.—A lovely species.

bífida, Linn. Terrestrial species from tropical Asia, with minute bladders and small yellow fls. resembling a diminutive Linaria or Butter and Eggs. Lvs. densely matted, erect, thread-like, 1–2 in. long: fls. yellow, with an orange pale, ⅜ in. long, 5–8 in a raceme: pedicels drooping in fruit. India, Malaya, China, Japan, Philippines. B.M. 6689.—Once cultivated at Kew.

janthina, Hook. Epiphytic Brazilian species growing in the leaf-axils of a bromeliad (Vriesia), with kidney-shaped lvs. and beautiful pale blue or lilac fls. 1½ in. across, ornamented by 2 vertical yellow lines on the palate edged with dark violet. Lvs. with stalks 4–6 in. long and blades 2–4 in. across: scape about 6-fld.: upper lip hemispheric, arching: lower lip transversely oblong, entire. B.M. 7466.—Int. by Sander, 1892. "Janthina" is the same as "ianthina," meaning violet-colored.

renifórmis, A. St. Hil. Brazilian species found in sphagnum bogs, having kidney-shaped lvs. and rose-colored fls. with 2 darker lines on the palate: upper lip truncate, emarginate; lower lip 3-lobed, the lateral lobes broad, the midlobe much shorter and scarcely produced. Brazil.—Once advertised by John Saul, but probably lost to cultivation. Very large for the genus, the lvs. ½–1 ft. long and scapes 1½–2 ft. high.

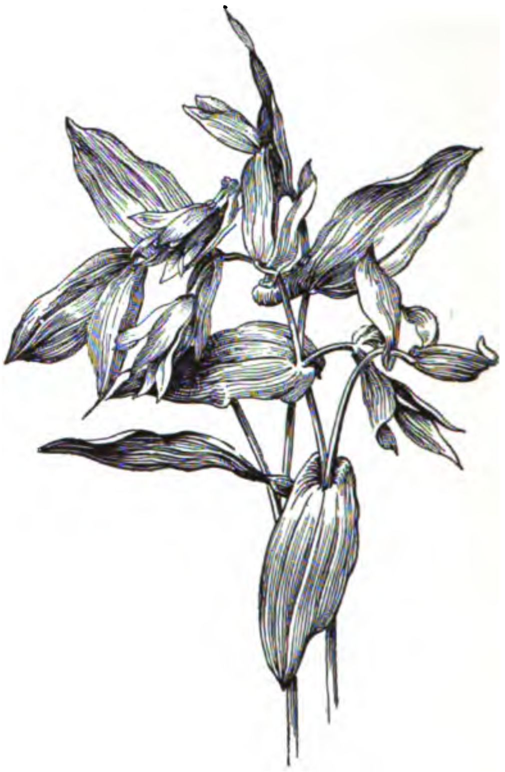
Húmboldtii, Schomb. Guiana species, with long-stalked, cordate or obcordate, mostly solitary lvs. and dark purple-blue fls. 2½ in. across, with a triangular lower lip. Scapes about 5-fld. F.S. 13:1390.—One of the showiest species. Commonly cult. in Eng., apparently not in America.

Éndresii, Reichb. Epiphytic Costa Rican species, with tubers about ¼ in. long, solitary lvs. and pale lilac fls. 1¾–2 in. across, with a yellow palate: lvs. 1–3 in. long, narrowly elliptic-lanceolate: scape about 5-fld. B.M. 6656. Var. **màjus**, Hort., was offered by Pitcher & Manda, 1895.—A deciduous species found at altitude of 2,000 feet.

longifòlia, Gardn. Fig. 2624. A Brazilian species, the typical form of which is perhaps not in cultivation. *U. Forgetiàna*, Hort., introduced by Sander, is said by the Kew authorities to be a form of this species and the same as the plant figured in Gn. 52:1132 (adapted in Fig. 2624) under the erroneous title of *U. latifolia*. It has beautiful violet-purple fls. nearly 2 in. across, with a yellow palate. Lvs. lanceolate, erect: scapes 12–20-fld. and fls. last well. G.C. III. 13:713.

W. M.

UVULÀRIA (Latin, *uvule*, palate, referring to the hanging flowers). *Liliàceæ*. BELLWORT. "WILD OATS" in some parts. A genus of two species of very graceful woodland, perennial herbs native to North America. The plants grow about 15 in. high, with a number of clustered slender stems which are forked and leaf-bearing mainly above. The foliage is of a delicate green, which with the terminal, narrow, bell-shaped, drooping flowers make the plants elegant though not showy. The species are perfectly hardy and easy of cultivation in any light, rich soil and a shady situation. They do well north of a wall in a well-prepared border and in such a position they far exceed the plants of the woods in luxuriance. Strong roots may be slowly forced for spring flowering. For distinction from Oakesia, see that genus, to which some of the plants commonly known as Uvularias are referred.



2625. Bellwort — Uvularia perfoliata (× ⅔).

A. *Lvs. pubescent beneath.*

grandiflòra, Sm. Stems 1–1½ ft. high, with 1 or 2 lvs. below the fork: lvs. oblong, oval or ovate, somewhat acuminate: fls. pale yellow, 1–1½ in. long; segments usually smooth on both sides: stamens exceeding the styles: capsule obtusely 3-angled, truncate. May, June. Rich woods, Quebec to Minn. south to Ga., Tenn. and Ia. B.B. 1:409.

AA. *Lvs. not pubescent beneath.*

perfoliàta, Linn. Fig. 2625. Stems more slender than in *U. grandiflora*, with 1–3 lvs. below the fork: lvs. oval, oblong or ovate: fls. pale yellow, about 1 in. long; segments glandular papillose within; stamens shorter than the styles: capsule obtusely 3-angled, truncate. May, June. Rich woods, U. S.

J. B. KELLER and F. W. BARCLAY.

V

VACCÍNIUM (classical Latin name of the European Whortleberry; etymology uncertain). *Ericàceæ.* Including BILBERRY, BLUEBERRY, HUCKLEBERRY, WHORTLEBERRY, CRANBERRY. Branching shrubs, creeping vines or small trees, sometimes epiphytes: lvs. alternate, evergreen or deciduous, coriaceous or membranaceous: fls. small, white, pinkish or reddish, in lateral racemes or terminal clusters, sometimes solitary in the axils, mostly nodding on slender-bracted pedicels and bearing blue, black or red berry-like fruits, mostly edible; calyx 4–5-toothed, adherent to the ovary, persistent, forming a crown-like appendage to the fruit; corolla various in shape, usually campanulate, cylindraceous or urn-shaped, rarely subglobose, 4–5-toothed or cleft; stamens twice as many as the lobes of the corolla, distinct, included within the corolla-tube or exserted; anthers often 2-awned at the back, the cells separate and prolonged upward into tubes at the apex, opening by terminal pores or chinks; pistil single, with a 4–5- or 8–10-loculed ovary, which is glabrous or hirsute. Flowers borne in spring with or before the leaves; berries ripe in summer and autumn, sweetish or sometimes acid, mostly edible. The genus includes about 125 species of wide geographic distribution, extending from the arctic circle to the high mountains of the tropics; most common in North America and the Himalayas. With very few exceptions (e. g., *V. erythrinum* in Java and *Emirnense* in Madagascar) the genus is unrepresented in the southern hemisphere and in the lower regions of the tropics.

There is much confusion in the popular names applied to these fruits. The terms "Bilberry" and "Whortleberry" usually mentioned as "common names" by American writers are seldom or never heard among the common people in this country; while "Huckleberry" is often used indiscriminately for plants of this genus and for the Gaylussacias. In the central states the term "Huckleberry" is usually applied to *V. corymbosum*, while "Blueberry" is given to the low-growing species, like *V. Canadensis* and *Pennsylvanicum*. In New England, "Huckleberry" is reserved for species of Gaylussacia, while "Blueberry" is applied to the lower growing species as above, and "High-bush Blueberry" to *V. corymbosum*. The red-berried species are, in general, referred to as "Cranberries."

Among the plants which lend tone to the landscape in October and November by reason of their bright foliage, many of the species of Vaccinium may be included,—the brilliant red, crimson and orange colors often persisting much longer than the bright-hued leaves of a majority of other plants. Of the ornamental species none are more strikingly beautiful late in the autumn than the common High-bush Blueberry, *V. corymbosum*. When well grown it is a stout, thick, spreading bush 8–10 ft. high. The plant is beautiful when in flower; the fruit is attractive and of the best quality, and the bright scarlet and crimson effects in late autumn, rivaling the sumach in brilliancy, are unsurpassed. As an ornamental plant the species deserves a place in every garden. *V. Pennsylvanicum* also brightens waste places for a short time, but drops its foliage too early to be worthy of planting as an undershrub. The same is true of *V. Canadense*, which is in many respects similar. *V. stamineum*, though early deciduous, is attractive when in bloom and throughout the summer, by reason of its graceful habit. Though usually found on gravelly soil, it will thrive in any good garden soil, and it is one of the very few ornamental shrubs specially suited for densely shaded situations. It has the peculiarity of never forming a true flower-bud, the blossom being open from the first. *V. arboreum* forms an irregular shrub too diffuse and straggling to be of value except in masses at the South. *V. hirsutum* is as beautiful in its autumn coloring as is *V. corymbosum* and, like that species, retains its foliage late in the season. *V. Vitis-Idæa* and *uliginosum*, with their shining box-like foliage, are effective as edging for the shrubbery border.

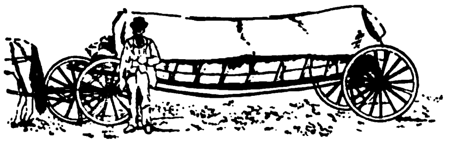
In the wild state the Blueberry was originally worthier of notice than was the blackberry, raspberry or currant, but the natural supply is so abundant that little attention has been given to garden cultivation. At the Maine Agricultural Experiment Station systematic work is in progress, and several instances of successful amateur cultivation are recorded from Massachusetts. The plants of some species are very susceptible of improvement under good cultivation; the best in order of merit being *V. corymbosum*, *vacillans* and *Canadense*. The bushes should be transplanted in the fall and treated much the same as currants. Any good garden soil is suitable.

Of all the American species used for food, the most important are, *V. corymbosum*, *Pennsylvanicum*, *Canadense* and *vacillans*. The first of these, the High-bush Blueberry, or Swamp Blueberry, or "Huckleberry" of the middle west, is of firm texture, good size and excellent flavor. The shrub is easily transplanted, grows rapidly on any good soil, and more than any other species shows a marked tendency to vary in the size, shape and quality of its fruit. It is the natural starting point in attempts to add the Blueberry to the list of cultivated fruits. During the past few years it has received considerable attention as a garden fruit, especially in New England. The other species named grow mostly on uplands,—*V. Pennsylvanicum*, especially, on dry sandy "barrens"—and form the bulk of the Blueberry crop as seen in the cities or at the canning factories.

In many of the northern and eastern states—particularly in New England, New York, New Jersey, Michigan and the mountain districts of Pennsylvania and West Virginia—there are many thousand acres of land, worthless for agricultural purposes, which after the pine is removed send up an abundant growth of Blueberry bushes, alders, poplars, gray birches and spireas. These lands are, for the most part, considered as public property and are recklessly burned over by irresponsible parties to promote the growth of the Blueberries. In New England, particularly in Maine, the management of such lands has been systematized and Blueberry canning has become an important industrial operation. In some instances the whole business is under the management of the landowners, but in most cases the land is divided into several tracts, each of which is leased to some responsible party who assumes the whole care of burning, keeping off trespassers, harvesting and marketing the fruit; the owner, in such cases, receiving as rental one-half cent per quart for all fruit gathered. Pickers receive 1½–3 cents per quart. Those who lease the land and haul the fruit to canning factory or station for shipment receive ½–1 cent per quart. These rates are determined in accordance with the market value of the crop.

Every year a certain section of each lease is burned over. This burning must be done very early in the spring, before the soil becomes dry; otherwise the fire goes too deep, the humus is burned from the ground and most of the bushes are killed. Many hundred acres on what should be the best part of the Blueberry plains have thus been ruined. The method most commonly used in burning a given area is for the operator to pass around the section to be burned, dragging after him an ordinary torch or mill-lamp. He then retraces his steps and follows over the burned area, setting new fires in the portions which have escaped and back-firing if there is danger of spreading unduly over areas which it is desired to leave unburned. A device occasionally used consists of a piece of ½-inch gas-pipe, bent near the end at an angle of about 60°. The end opposite the bent part is closed with a cap or plug and in the other end, after filling the pipe with kerosene, is placed a plug of cotton waste or tow. This device is by many considered superior to the lamp or torch, as it is more easily handled. Each section of the lease is usually burned over every third year. In this way the birches and alders are subdued and the Blueberries spring up quickly and bear a maximum crop the year following the burning.

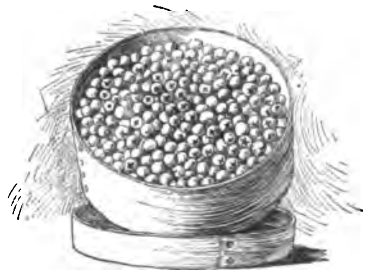
The Blueberries have an advantage over other small fruits in that they will stand shipment better and will keep longer than the others, with the exception of currants and gooseberries. By far the largest proportion of the fruit is taken to the factories for canning. Early in the season, however, before the factories are opened, a considerable amount is shipped to the larger cities for use while fresh. This fruit is usually shipped in quart boxes, as shown in Fig. 2627.



2626. "Buckboard" used in Maine to carry Blueberries from the fields to the cannery.

All of the early fruit is picked by hand and only ripe berries are gathered. Later in the season, particularly on "old burns," i. e., on areas which will have to be burned over the next year, the fruit is gathered with a "blueberry rake." This is an implement somewhat similar to the cranberry rake in use on Cape Cod, and may be likened to a dust-pan, the bottom of which is composed of stiff parallel wire rods. See Fig. 2628. The fruit may be gathered much more quickly and more cheaply by means of the rake. The bushes are, however, seriously injured by the treatment. In no case should the rake be used in gathering the High-bush Blueberries. As the berries are gathered they are passed through a fanning mill to eliminate leaves and twigs before being sent to the canning factory. At the factory they are again submitted to a much stronger winnowing. This is the only preparation required for market.

The financial importance of the Blueberry industry is very difficult to estimate at the present time. In Maine the canning of Blueberries is largely in the hands of a few packers. The largest of the factories has a daily capacity of 700 bushels and the average annual output is 8,300 cases of 2-dozen cans each, representing 6,250 bushels of fresh fruit. The average price per case for the canned fruit is $1.90. The value of the annual product of this one factory is not far from $15,000. The total canned product of Maine's "Blueberry barrens" in 1899 was about 50,000 cases and the price per case was $2.20, making the value of the Blueberry crop in this one small section considerably more than $100,000. In northern Michigan the annual shipments are from 3,000–5,000 bushels. In New Jersey, Pennsylvania and West Virginia large quantities of the fruit are gathered from the plains and mountains, but the work is not systematized.

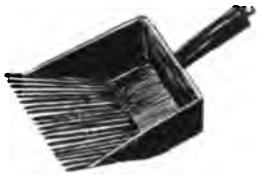


2627. A quart box of fancy Blueberries, prepared for market.

White or pinkish fruits, instead of the usual deep blue-colored berries, are not uncommon in certain localities. In some cases these are albino forms; in others the color is due to a fungus. Albino forms of *V. Myrtillus* were recorded as early as 1578 by Dodoens. The other species thus far recorded are: *V. Vitis-Idæa, Pennsylvanicum, corymbosum* and *vacillans*. It is probable, however, that many other species exhibit this variation. No special reason can be assigned for this difference in color. The white forms are found growing (usually in colonies) by the side of the normal type. If exposed to full sunlight, the fruit is very likely to have a blush cheek, or even to be of a scarlet color. The albino forms must, however, be carefully distinguished from the "white berries" caused by the presence of a fungous growth (*Sclerotinia baccarum*).

Propagation.—In the past one chief drawback in the dissemination of the Blueberries has been the difficulty, or supposed difficulty, of propagation. The few nurserymen who have offered them for sale have usually depended upon the native heaths and pastures for their supply of plants, rather than upon the nursery rows. The results have been most discouraging, and the Blueberries, though among the finest of fruits, are almost unknown in cultivation.

In the case of the cranberries, propagation is effected almost exclusively by cuttings (see *Cranberry*). With the Blueberries, grafting is easily performed, and in this way specially choice individuals may be perpetuated. For general purposes, however, seedlings or division may be used. Propagation by seed naturally requires care and skill, but is entirely feasible. The method followed at the Arnold Arboretum, and at the Maine Agricultural Experiment Station, where for several years seedling Blueberries have been grown, is essentially as follows: Seed-pans or boxes about 4 in. deep are half filled with potsherds and covered with a layer of sphagnum, after which a compost consisting of one-third each of fibrous peat, well-rotted sod and fine sand, is used; the whole being firmed with the hand or with a mallet. The seed, washed free from the pulp of freshly gathered fruit, is then sown thickly, pressed down lightly and covered with a slight sprinkling of sphagnum. The boxes are placed in a coldframe until January, when they are brought to a house with a temperature of 55°–60° and a range of 10° higher by day. As the young seedlings appear, the sphagnum is gradually removed and a quantity of compost sifted in among the plants. The young plants are treated like other delicate seedlings, and handled about twice during the first season. After Sept. 1 they are hardened off and later removed to a coldframe for winter, the frames being protected to retain the foliage as late as possible and covered with hay or litter during the winter. The next spring the plants are set about 6 inches apart in a well-prepared bed and shaded until thoroughly established. Clean tillage is given during the season. At the approach of winter, a few inches of loam between the plants to prevent heaving is the only protection required. The following spring, or two years from seed, they may be planted out permanently. Seed which is kept until dry and then sown, even if given the best of care, will seldom germinate until the second year. The low Blueberry (*V. Pennsylvanicum*) will usually fruit in three to four years from seed; but *V. corymbosum* requires four to six years. See Bull. 76, Maine Exp. Sta.



2628. Blueberry rake.

INDEX.

albiflorum, 18.
amœnum, 18.
angustifolium, 10, 11.
arboreum, 24.
arbuscula, 10.
atrococcum, 19.
cæspitosum, 10.
Canadense, 13.
Constablæi, 18.
corymbosum, 18.
crassifolium, 20.
erythrinum, 22.
erythrocarpon, 5.
fuscatum, 17, 18.
hirsutum, 14.
macrocarpon, 3.
melanocarpum, 25.
Myrsinites, 7.
myrtilloides, 15.
Myrtillus, 9.
nigrum, 12.
nitidum, 6.
ovalifolium, 16.
ovatum, 23.
Oxycoccus, 1.
pallidum, 18.
parvifolium, 4.
Pennsylvanicum, 11.
Sprengelii, 7.
stamineum, 25.
tenellum, 17.
uliginosum, 21.
vacillans, 8.
virgatum, 17.
Vitis-Idæa, 3.

Botanical Classification.—In the following scheme the species are separated on the basis of natural characters. When two closely related forms occur over wide range in latitude, however, the assigned differences are liable to fail at some point. The key will be found useful in determining herbarium specimens.

- A. *Ovary 4-5-loculed (rarely 8-10-loculed in V. Vitis-Idæa).*
  - B. *Stamens long-exserted.*
    - C. *Filaments villous* .... 5. **erythrocarpon**
    - CC. *Filaments puberulent.*
      - D. *Stems very slender, creeping* .... 1. **Oxycoccus**
      - DD. *Stems stouter, with ascending branches* ..... 2. **macrocarpon**
  - BB. *Stamens included.*
    - C. *Filaments glabrous or pubescent.*
      - D. *Corolla commonly 4-lobed: stamens 8* .....21. **uliginosum**
      - DD. *Corolla commonly 5-lobed: stamens 10.*
        - E. *Plants dwarf, a foot or less high.*
          - F. *Branches not angled.*10. **cæspitosum**
          - FF. *Branches sharply angled* .... 9. **Myrtillus**
        - EE. *Plants taller, 1-12 ft. high.*
          - F. *Margins of leaves sharply serrulate.*15. **myrtilloides**
          - FF. *Margins of leaves entire (except in V. ovalifolium).*
            - G. *Length of lvs. 1-2 inches* ....16. **ovalifolium**
            - GG. *Length of lvs. ¼-¾ inches* .... 4 **parvifolium**
    - CC. *Filaments pilose.*
      - D. *Twigs red. Here probably belongs* ....22. **erythrinum**
      - DD. *Twigs not red.*
        - E. *Stamens 10: ovary 5-loculed.*
          - F. *Branchlets pubescent* ....23. **ovatum**
          - FF. *Branchlets glabrous* ....20. **crassifolium**
        - EE. *Stamens 8: ovary 4-loculed* .... 3. **Vitis-Idæa**
- AA. *Ovary 10-loculed (sometimes imperfectly so).*
  - B. *Anthers with 2 awns on the back.*
    - C. *Stamens included* ....24. **arboreum**
    - CC. *Stamens exserted* ....25. **stamineum**
  - BB. *Anthers awnless.*
    - C. *Foliage evergreen, coriaceous.*
      - D. *Calyx-teeth roundish and very dense* .... 6. **nitidum**
      - DD. *Calyx-teeth acute* .... 7. **Myrsinites**
    - CC. *Foliage deciduous (sometimes tardily so in southern forms).*
      - D. *Corolla cylindraceous* ..17. **virgatum**
      - DD. *Corolla short and usually broad.*
        - E. *Branchlets hirsute* ...14. **hirsutum**
        - EE. *Branchlets glabrous or glaucous (except in V. Canadense).*
          - F. *Lvs. glaucous and pale beneath.*
            - G. *Fruit blue* .... 8. **vacillans**
            - GG. *Fruit black* ......12. **nigrum**
          - FF. *Lvs. strongly pubescent both sides* ...13. **Canadense**
          - FFF. *Lvs. glabrous, often hairy on midrib beneath.*
            - G. *Margin of lvs. bristly-serrulate* ....11. **Pennsylvanicum**
            - GG. *Margins of lvs. entire or at most ciliate.*
              - H. *Berry blue, glaucous* .....18. **corymbosum**
              - HH. *Berry black, not glaucous.*19. **atrococcum**

Horticultural Classification.—The following key to the more commonly known species is based upon horticultural or garden characters:

- A. *Species cultivated chiefly for fruit.*
  - B. *Color of fruit red.*
    - C. *Stems slender, trailing: lvs. evergreen.*
      - D. *Apex of leaves acute* .... 1. **Oxycoccus**
      - DD. *Apex of leaves obtuse or retuse* .... 2. **macrocarpon**
    - CC. *Stems stouter though creeping: branches erect, tufted* .... 3. **Vitis-Idæa**
    - CCC. *Stems erect, much taller, 2-10 ft.*
      - D. *Lvs. small, ¼-¾ in. long.* 4. **parvifolium**
      - DD. *Lvs. larger, 1½-3 in. long* .... 5. **erythrocarpon**
  - BB. *Color of fruit blue or black.*
    - C. *Plant low, ½-3 ft. high.*
      - D. *Foliage evergreen.*
        - E. *Lvs. small, ¼-½ in. long* .... 6. **nitidum**
        - EE. *Lvs. larger, ⅓-1 in.* .. 7. **Myrsinites**
      - DD. *Foliage deciduous.*
        - E. *Surface of lvs. glabrous.*
          - F. *Lvs. pale beneath, not shining above. (See also No. 12. Here might be sought V. corymbosum, var. pallidum, No. 18.)* 8. **vacillans**
          - FF. *Lvs. not paler beneath, shining, at least above. (Exceptions: No. 12 always paler beneath; No. 11 rarely paler beneath.)*
            - G. *Fls. solitary in the axils.*
              - H. *Branches sharply angled* .... 9. **Myrtillus**
              - HH. *Branches not angled* ....10. **cæspitosum**
            - GG. *Fls. in fascicles or short racemes.*
              - H. *The lvs. not paler beneath.*11. **Pennsylvanicum**
              - HH. *The lvs. paler beneath* ......12. **nigrum**
        - EE. *Surface of the lvs. hairy.*
          - F. *Ovary and fr. glaucous* ....13. **Canadense**
          - FF. *Ovary and fr. hirsute* ....14. **hirsutum**
    - CC. *Plant taller, 3-12 ft spreading.*
      - D. *Fls. solitary in axils.*
        - E. *Lvs. sharply serrate.*15. **myrtilloides**
        - EE. *Lvs. entire or slightly serrulate* ....16. **ovalifolium**
      - DD. *Fls. in racemes or corymbs.*
        - E. *Racemes elongated on naked branches* ....17. **virgatum**

EE. *Racemes shorter.*
  F. *Corolla cylindric: fr. blue*...........18. **corymbosum**
  FF. *Corolla urn-shaped: fr. black*.........19. **atrococcum**
AA. *Species cultivated chiefly for ornament.*
  B. *Plants low, 1–2 ft. high.*
    C. *Stems creeping, with branches erect, or ascending.*
      D. *Lvs. small, shining*.....20. **crassifolium**
      DD. *Lvs. larger, pale or glaucescent*...............21. **uliginosum**
    CC. *Stems erect: twigs red*....22. **erythrinum**
  BB. *Plants taller, 2–20 ft. high.*
    C. *Foliage evergreen, rigid*..23. **ovatum**
    CC. *Foliage deciduous.*
      D. *Surface shining above, more or less pubescent beneath*...............24. **arboreum**
      DD. *Surface paler above, glaucous beneath*.....25. **stamineum**
      DDD. *Surface bright green both sides. (Here might be sought No. 5.)* 5. **erythrocarpon**

1. **Oxycóccus,** Linn. SMALL CRANBERRY. CRANBERRY of the Old World. Slender creeping plants with short, filiform stems 4–10 in. long: lvs. ovate acute or acuminate, ¼ in. long, with revolute margins: pedicels 1–4, terminal: corolla deeply 4-parted, the lobes reflexed; anthers exserted, with very long terminal tubes: berry red, globose, ¼–⅓ in. in diam., 4-loculed. Sphagnum swamps in subarctic and alpine regions.—Though smaller, its fruit is by many considered superior to that of the next.

2. **macrocárpon,** Ait. LARGER AMERICAN CRANBERRY. Stems slender, creeping, elongated (1–4 ft.), the flowering branches ascending: lvs. oblong or oval, obtuse or retuse, ⅓–½ in. long, whitened beneath: pedicels several, axillary and lateral: berry red or reddish, globose or pyriform, ⅓–1 in. long. N. America. B.M. 2586. Em. 2:456. See *Cranberry.*

2629. Cowberry or Mountain Cranberry—Vaccinium Vitis-Idæa (× about ⅓).

3. **Vitis-Idæa,** Linn. COWBERRY. MOUNTAIN CRANBERRY. FOXBERRY. Fig. 2629. Plants low (6–10 in.): lvs. coriaceous, persistent, obovate or oval, ¼–¾ in. long, dark green and shining above, with blackish bristly points beneath: fls. in short, terminal racemes; corolla white or rose-colored, 4-cleft: berries dark red, acid, rather bitter. Arctic regions, south to coast of New England, Minn. and Brit. Col. B.B. 2:580. L.B.C. 7:616 (as var. *major*); 11:1023 (var. *minor*).—The fruits, which are rather larger than currants, acid and somewhat bitter when uncooked, are largely used in the more northern regions for tarts, jellies and preserves, or as a substitute for the common cranberry. According to Macoun, the fishermen's families along the Gaspé coast and the north shore of the Gulf of St. Lawrence gather the fruit of this species in large quantities for their own use and for sale, calling it "Low-bush Cranberry." Throughout the whole of northern Canada hunters and trappers, as well as the native Indians, have frequently to depend upon it for food. It is valuable for the shrubbery border, where the strong contrast of the dark green foliage and the bright-colored persistent fruit is very striking.

4. **parvifòlium,** Smith. Shrub, 6–12 ft. high, straggling, with slender, green, sharply angled branches: lvs. oblong or oval, obtuse, entire, dull or pale, ¼–¾ in. long: fls. solitary in the axils; corolla globular, nearly white; calyx 5-lobed: berries light red, rather dry. Northern Calif. to Alaska.—Offered by only one nurseryman. T. J. Howell, of Oregon. characterizes the fruit as "of good flavor, excellent for tarts," while Gray says "rather dry, hardly edible."

5. **erythrocárpon,** Michx. Shrub, erect, divergently branching, 1–4 ft. high: lvs. oblong-lanceolate, acuminate, serrate, thin, 1⅓–3 in. long: pedicels solitary, axillary, bractless: corolla flesh-colored, ½ in. long, 4-cleft, revolute: berries globose, ⅓ in. in diam., light red, turning to deep blue-black at full maturity, watery, slightly acid, scarcely edible. July. Higher Alleghanies, Va. to Ga. B.M. 7413.

6. **nitidum,** Andr. A diffusely much branched shrub, with smooth branchlets: lvs. thick, coriaceous, shining above, obovate or oblong: fls. in fascicles on short racemes, the almost persistent bracts as well as the roundish or obtuse calyx-teeth reddish; corolla short-campanulate, 5-toothed: berry "somewhat pear-shaped, black." Fla. and Ga. —Near to or passing into *V. Myrsinites.*

7. **Myrsinites,** Lam. Low, evergreen shrub erect or decumbent: lvs. exceedingly variable, ¼–1 in. long, entire or serrulate, sometimes denticulate, mostly shining above; bracts and calyx-teeth acute or acutish: berries "globose, blue." Sandy pine barrens N.Car. to Fla. and La. B.M. 1550 (as *V. nitidum,* var. *decumbens*).—The difference between this species and the preceding is obscure. The chief points of distinction seem to be that *V. Myrsinites* has puberulent branchlets, prominently veined lvs. and acute calyx-teeth and bracts, while *V. nitidum* has smooth branchlets, smaller and faintly veined lvs., with obtuse or roundish calyx-teeth and bracts. Grown as a pot-plant in coolhouses in England under the name of *V. Sprengelii.*

8. **vacillans,** Kalm. LOW BLUEBERRY. BLUE HUCKLEBERRY. Erect, glabrous: lvs. obovate or oval, entire or sparingly serrulate: fls. in rather loose clusters, generally on leafless summits of twigs; corolla campanulate or cylindraceous, contracted at the mouth: berries large, blue, with much bloom, of excellent flavor, ripening with *V. Canadense.* Dry, sandy, or rocky places, N. Amer. B.B. 2:579. Em. 1:454.—One of the most common species of the northern and central states, particularly west of the Alleghanies. The fls. are quite showy, while the fruit is particularly valuable.

9. **Myrtillus,** Linn. WHORTLEBERRY. BILBERRY. Low shrubs, glabrous: lvs. ovate or oval, serrate, conspicuously veined, ⅓–⅔ in. long: calyx almost entire: berries black, nodding. Mountainous regions, N. Amer., Eu., Asia.—The most widely distributed species and very generally used as an article of diet and in the making of drinks, particularly in the Old World. It is from this species that the common name Whortleberry is derived. Not of special importance in America.

10. **cæspitòsum,** Michx. DWARF BILBERRY. A dwarf tufted shrub, 3–12 in. high, nearly glabrous throughout: lvs. obovate, obtuse or acutish, serrulate, shining on both sides: fls. solitary; corolla obovoid, pink or white, slightly 5-toothed (rarely 4-toothed): berries large, globose, blue with bloom, sweet. N. Amer. B.B. 2:576

B.M. 3429—It is doubtful if varieties can be distinguished. Var. **arbúscula**, Gray, passes into the ordinary form; while vars. **angustifòlium**, Gray, and **cuneifòlium**, Nutt., are found to be simply forms produced by shade. The last form, particularly, is common in New England, and early in the season the lvs. are of the ordinary obovate type, while later they become elongated. Recommended by Warren H. Manning for the rock garden.

11. **Pennsylvánicum**, Lam. Low Blueberry. Fig. 2630. A dwarf shrub, 6–15 in. high: lvs. membranaceous, oblong-lanceolate or oblong, distinctly serrulate with bristle-pointed teeth, mostly shining on both sides but often hairy on midrib beneath: fls. on short pedicels; corolla campanulate-cylindrical, short: berries large, globose, bluish black with bloom, sweet, the earliest to ripen north. N. Amer. B.M. 3434. B.B. 2:578. Em. 2:456. Rep. Me. Exp. Sta. 1898:171.—Var. **angustifòlium**, Gray. A dwarf form, with more decidedly lanceolate lvs. Lake Superior and northward.—This species is extremely variable in size and shape of fruit and flowers, but with the exception of the variety noted and the black-fruited form often associated with it, which is set off as *V. nigrum*, the variations do not appear sufficiently constant to warrant making separations. In general, the plant is of low, semi-prostrate habit, is extremely prolific and thrives on dry, sandy hills. It furnishes the bulk of the Blueberries found in the eastern markets. When mown down or burned, the new erect shoots produce, the following year, a long, spike-like mass of bloom and fruit which may be stripped off by handfuls. Because of its character and early-ripening habit, it is known on the Blueberry plains as "Early Sweet" or "Low Sweet."

2630. Vaccinium Pennsylvanicum — Low Blueberry (×⅓).

12. **nigrum**, Britton. Low Black Blueberry. Low shrub, similar to *V. Pennsylvanicum*, and often associated with it: lvs. oblong-lanceolate to obovate, finely serrulate, green above, pale and glaucous beneath: fls. few in the clusters, white or cream-colored, appearing earlier than those of *V. Pennsylvanicum*: berries rather small, black without bloom. Dry rocky soil, N. Amer. B.B. 2:579. Rep. Me. Exp. Sta., 1898:171.—This species is distinguished from the preceding by the glaucous under surfaces of the leaves and by the characteristic shining black fruit. It is usually found in colonies in the same situations as *V. Pennsylvanicum;* but occasionally the two species will be found intermingled.

13. **Canadénse**, Richards. Canada Blueberry. Erect shrubs, 1–2 ft. high, the crowded branchlets downy-pubescent: lvs. oblong-lanceolate or elliptical, entire, downy on both sides: corolla short, open-campanulate, greenish white, often tinged with red: berries globose or oblate, blue with much bloom, of excellent flavor. Low woods, Hudson Bay to Bear Lake and the northern Rocky Mts.; south to New Eng., mts. of Pa. and Ill. B.M. 3446. B.B. 2:578.—This species, commonly known as "Velvet Leaf" or "Sour Top" because of the character of its foliage and the somewhat acid fruit, usually grows in rather moist, rocky, not swampy, localities. The fruit is larger and more acid than the other low forms and matures from one to three weeks later. It is not so popular in the general market as the sweeter kinds, but it is very prolific and its lateness in ripening is a point in its favor.

14. **hirsùtum**, Buckley. Hairy Huckleberry. Bear Huckleberry. Low shrub, 1–2 ft. high: stems green, grooved, obscurely 4-angled, those of the current year covered with stout, spreading white hairs: lvs. ovate, entire and, together with the pure white campanulate corolla, the calyx and the dark blue globose fruit, hirsute. Very local in N. C., Ga. and Tenn. G.F. 2:365.—This species, discovered about 1840, was lost sight of for half a century until rediscovered by Sargent and transferred to the Arnold Arboretum. It is readily distinguished by the hairy flower and fruit. The fruit is described as fully as large as that of *Gaylussacia resinosa*, shining black, and of an agreeable flavor. Under cultivation not so densely hairy as in the wild state. Gives promise of being valuable under cultivation as one of the latest of its kind to ripen,—at the Arnold Arboretum the best period of fruitage being the middle of August, berries remaining into September.

15. **myrtilloides**, Hook. An erect, branching shrub, mostly glabrous throughout, the twigs slightly angled: lvs. oval, oblong or ovate, acute, serrate, membranous, green on both sides but not shining, 1–2 in. long: calyx entire; corolla depressed-globular, yellowish or greenish white: berries large, oblate, black, rather acid. Lake Superior westward. B.M. 3447.—The berries are large, ½–¾ in., oblate, with broad calyx, of excellent flavor; much relished by the natives of the northwest.

16. **ovalifòlium**, Smith. A slender, straggling, branched shrub 3–12 ft. high, with slender more or less angled branchlets: lvs. oval, obtuse, glabrous, green above, glaucous beneath: fls. solitary, on short, recurved pedicels; corolla globose-ovoid: berry large, ⅓–½ in., bluish purple, with bloom. Woods, Quebec to Mich., Ore. and Alaska. B.B. 2:577.—This species is very abundant in the northwest, forming a large part of the undergrowth along the southern coast of Alaska (Funston). The berries, rather larger than peas, are collected in great quantities by the Indians, who use them fresh and dry them for winter. The exceptionally large berries and vigorous habit of this species suggest its value for cultivation and particularly for crossing with the low-growing species, such as *V. Pennsylvanicum* and *Canadense*.

17. **virgàtum**, Ait. A shrub 3–12 ft. high, with slender green branches, the young twigs puberulent: lvs. narrowly oval-oblong, acute, often mucronate, entire or minutely serrulate, green and glabrous above, pale or glaucous beneath, ¾–2 in. long: fls. in short racemes on naked twigs, appearing before the lvs.; corolla nearly cylindrical, white or pink: bracts small, deciduous: berry black, with or without bloom. Swamps, southern Va. to Fla. and La. B.B. 2:577. B.M. 3522. B.R. 4:302 (as *V. fuscatum*).—The distinction between this species and the next is very slight. It is probable that, possibly excepting var. *tenellum*, this is only a southern form of *V. corymbosum* and should be reduced to varietal rank.

Var. **tenéllum**, Gray (*V. tenéllum*, Ait., not Pursh). A low form, mostly less than 2 ft., with smaller lvs. and nearly white fls. in short, close clusters. Southern Va. to Ark., Fla. and Ala.—Probably a distinct species.

18. **corymbòsum**, Linn. High-bush Blueberry. Swamp Huckleberry. Fig. 2631. A tall, straggling shrub, 4–12 ft. high, with yellowish green warty branch-

lets which later turn brownish: lvs. ovate or oblong to elliptical-lanceolate, usually entire: fls. in short racemes on naked twigs; corolla ovate to urn-shaped, or oblong-cylindrical, white or pinkish: berries blue-black, with much bloom, of excellent flavor. Moist woods or swamps, N. Amer. Em. 2:454. American Agriculturist 1886:364. B.B. 2:577.—Exceedingly variable, and numerous gradations unite the several varieties. *V. corymbosum* is one of the most valuable species both for fruit and as an ornamental shrub. It thrives in the garden and is readily susceptible of improvement by cultivation.

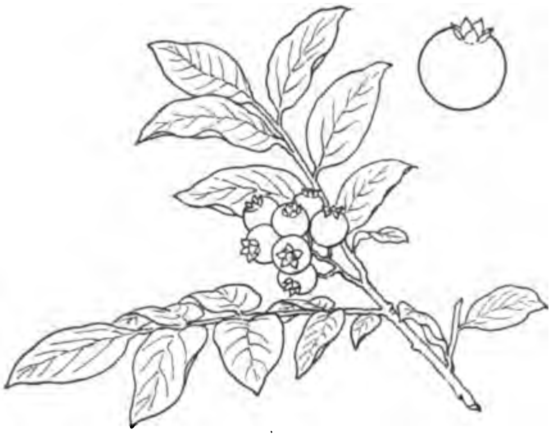
Var. **amœnum**, Gray (*V. amœnum*, Ait.). A form with bristly ciliate, serrulate leaves, bright green on both sides, shining above, often pubescent on veins beneath. Mainly in the Middle Atlantic states. B.R. 5:400. B.M. 3433 (as *V. corymbosum*).

Var. **pállidum**, Gray (*V. pállidum*, Ait. *V. albiflòrum*, Hook. *V. Cónstablæi*, Gray). A pale and glaucous or glaucescent form, with or without some pubescence: ovary more completely inferior, generally low, otherwise resembling var. *amœnum*. Common in mountainous regions southward. B.M. 3428. B.B. 2:579.

Var. **fuscàtum**, Gray (*V. fuscàtum*, Ait.). A tall form with the mature and entire lvs. fuscous-pubescent beneath: fls. virgate, somewhat spicate on the naked flowering twigs. Ala. and Fla. to La. and Ark.

19. **atrocóccum**, Heller (*V. corymbòsum*, var. *atrocóccum*, Gray). BLACK BLUEBERRY. A branching shrub with shreddy bark, similar to *V. corymbosum:* lvs. oval or oblong, dark green above, densely pubescent beneath, entire, acute, often mucronate: fls. in short racemes, appearing with the lvs.: berry black, without bloom, sweet. Moist woods and swamps, northeastern N. Amer. B.B. 2:578.

20. **crassifòlium**, Andr. Slender, trailing shrub: stems 2–3 ft. long, glabrous: lvs. small, ¼–½ in. long, oval or narrowly oblong, sparsely serrulate or entire, shining: fls. few, almost sessile, in small, axillary clusters, nearly white or tinged with red: berries black. Sandy bogs, N. C. to Ga. B.M. 1152. — Useful for the shrubbery border south.



2631. High-bush Blueberry — Vaccinium corymbosum. (spray × ½).

21. **uliginòsum**, Linn. BOG BILBERRY. A stiff, much-branched shrub ½–2 ft. high: lvs. thick, obovate or oval, obtuse or retuse, ½–1 in. long, nearly sessile: fls. 2–4 together, or sometimes solitary; calyx 4-parted, sometimes 5-parted; corolla urn-shaped, 4- or 5-lobed, pink; stamens 8–10: berries bluish black, with bloom. N. Amer., Eu., Asia. B.B. 2:576.—The plant is useful for the shrubbery border in cold, wet locations, and its fruit, though of poor quality, is used for food by the natives of the northwest.

22. **erythrinum**, Hook. An erect, glabrous, evergreen shrub with bright red twigs: lvs. ovate, obtuse, coriaceous, entire: fls. in long, 1-sided, terminal racemes; corolla cylindraceous, 5-toothed, ½ in. long, purple, reddish. Mountainous regions, Java. B.M. 4688. J.H. III. 34:39.—Sent to England in 1852 and since grown by various nurserymen as a greenhouse pot-plant. It is a strong plant, furnishing an abundance of bloom in Dec. and Jan. Not remarkable, but worthy a place in collections. A very distinct type.

23. **ovàtum**, Pursh. An erect, rigid, evergreen shrub, 3–8 ft. high, with pubescent branchlets: lvs. very numerous, thick, shining, ovate or oblong, acute, serrate: fls. numerous, in short, axillary clusters, followed by dark purple fruit of agreeable flavor. Vancouver's Island to Monterey, Calif. B.R. 16:1354.—A distinctly western species, and one of California's most beautiful hedge plants, but not well known. *V. ovatum* is very tenacious of life and bears pruning well; propagated from suckers, cuttings and seeds, which last it bears freely.

24. **arbòreum**, Marshall. FARKLEBERRY. SPARKLEBERRY. Spreading shrub or small tree, 6–25 ft. high, with glabrous or somewhat pubescent branchlets: lvs. thinnish, coriaceous, smooth and shining above, obovate to oblong, entire or obscurely denticulate: fls. profuse, axillary and leafy racemose; corolla white, 5-lobed: berry small, globose, rather astringent. Sandy soil along river banks, Fla. and Tex. to N. C. and Ill. L.B.C. 19:1885. B.M. 1607 (as *V. diffusum*). B.B. 2:580.—It forms an irregular shrub too diffuse and straggling to be of value except in masses, for which purpose it is useful at the South.

25. **stamíneum**, Linn. DEERBERRY. SQUAW HUCKLEBERRY. A divergently branched shrub, 2–5 ft high, with pubescent or glabrous twigs: lvs. oval to oblong-lanceolate, acute, entire, pale, glaucous or sometimes slightly pubescent beneath, 1–4 in. long, ½–1½ wide: fls. very numerous, in large leafy-bracted racemes; corolla green, 5-cleft; anthers and style exserted: fr. large, globose or pyriform, greenish or yellowish, few-seeded, almost inedible. Dry woods and thickets, N. Amer. B.B. 2:580.

Var. **melanocárpum**, Mohr. SOUTHERN GOOSEBERRY. Shrub, 2–3 ft. high, branched from near the base: lvs. as in the type: fls. in loosely 4–8-fld. elongated racemes: berries twice the size of the typical form, shining black, with a juicy purple pulp, sweetish, with slightly tart, flavor. S. States.—Probably a distinct species. Will thrive on any good, well-drained soil and is a valuable shade-enduring ornamental shrub. W. M. MUNSON.

VAGÀRIA (meaning obscure). *Amaryllidàceæ*. A single species, a bulbous autumn-flowering plant from Syria with strap-shaped leaves produced after the flowers, which are quite freely produced in 6–8-fld. umbels on naked scapes about 1 ft. high: perianth-tube short, funnel-shaped at the apex; segments equal, lanceolate, stamens inserted on throat of tube; filaments quadrate: ovary globose, 3-loculed, with 2–3 ovules in each locule.

parviflòra, Herb. Bulb globose, about 1½ in. through: fls. white. Offered by European bulb-growers.

F. W. BARCLAY.

VALERIAN. See *Valeriana*. **Greek V.** is *Polemonium*. **Red V.** is *Centranthus*.

VALERIÀNA (Latin *valeo*, to be strong, in allusion to medicinal uses). VALERIAN. *Valerianàceæ*. A large genus (probably more than 150 species) of widespread herbs, mostly of the northern hemisphere. Less than a dozen species are North American. The Valerians are erect-growing, mostly tall perennials, with strong-smelling roots, and bearing many small white, pink or rose-colored flowers in terminal cymose or cymose-paniculate clusters. Corolla tubular or trumpet-shaped, the limb nearly equally 5-toothed or lobed, the tube usually swollen at the base; stamens 3: ovary 1-loculed (by abortion), bearing an entire or somewhat 2–3-lobed style, ripening into an akene: calyx of bristle-form lobes: lvs. opposite, various.

The Valerians in the American trade are hardy perennials of easiest culture. Only *V. officinalis* is well known. This is one of the characteristic plants of old gardens, being prized for the spicy fragrance of its numerous flowers in spring. It spreads rapidly from suckers arising from the roots, soon forming large colonies. The common species are often grown from seeds. *V. alba* and *V. rubra* of the trade are no doubt *Centranthus ruber*.

A. *Rootstocks horizontal or ascending, with small fibrous roots.*

B. *Stem-leaves (at least the lower ones) pinnate or pinnately lobed.*

officinàlis, Linn. COMMON VALERIAN. GARDEN HELIOTROPE. CAT'S VALERIAN. ST. GEORGE'S HERB. Fig. 2632. Somewhat pubescent: stem erect, simple below but somewhat branching above, 2–5 ft.: lvs. all pinnate, with several to many lanceolate to linear acuminate toothed or notched leaflets: fls. numerous, whitish, pinkish or lavender, very fragrant. Europe, N. Asia. — The medicinal valerian is obtained mostly from the roots of this species.

2632. Garden Heliotrope — Valeriana officinalis (×⅕).

Phù, Linn. Glabrous, usually less tall than the above: root-lvs. simple; stem-lvs. lobed or bearing 5–7 entire leaflets: fls. whitish. Caucasus. Var. **aùrea**, Hort., has young shoots golden yellow.

dioìca, Linn. MARSH VALERIAN. About 1–2 ft.: root-lvs. oval, elliptic or spatulate and entire, long-stalked; stem-lvs. mostly pinnate with entire leaflets or divisions, the terminal leaflet oval or oblong and the lateral ones smaller and narrower: fls. mostly unisexual, the sterile ones the larger, all pale rose color. Europe, in moist soil.

Sitchénsis, Bong. A foot or less, the rootstocks thick and ascending: root-lvs. ovate or oblong, simple or somewhat lobed; stem-lvs. mostly 3–5-foliolate, the divisions or leaflets orbicular to oblong-ovate: fls. white, very fragrant, in contracted cymes, the corolla about ⅓ in. long. Rocky Mts. to Alaska. G.F. 9:515. — A very early bloomer.

BB. *Stem-leaves not compound nor lobed, but sometimes dentate.*

montàna, Linn. Usually one ft. or less high, glabrous or nearly so: root-lvs. oblong, oval or orbicular-oblong, usually obtuse, somewhat dentate; stem-lvs. lanceolate-acuminate, dentate or nearly entire: fls. bright rose, diœcious. Eu. L.B.C. 4:317.

AA. *Rootstocks perpendicular, branching below.*

édulis, Nutt. Two–4 ft., glabrous or nearly so: root-lvs. oblanceolate or spatulate with margined petiole, entire to pinnatifid; stem-lvs. few, sessile, parted into linear or lanceolate divisions: fls. yellowish white, in an elongated panicle, more or less diœcious. Ohio to Arizona and British Columbia, in wet or moist lands. — The roots are eaten by Indians. The leaves are thickish and strongly veined.

The African or Algerian Valerian is *Fèdia Cornucòpiæ*, Gaertn. (Valeriana Cornucopiæ, Linn. Valerianella Cornucopiæ, Loisel.). It is an Algerian annual used for salad, after the manner of corn salad. It does not appear to be in the Amer. trade. Glabrous, branching, 1½ ft. or less high: lvs. oval-oblong, thickish, simple, somewhat toothed, those of the stem clasping: fls. long-tubular, pink, in terminal clusters. Cult. as for corn salad, although it endures less cold. It thrives well in warm weather when not allowed to suffer for water. B.R. 2:155.—*V. tripteris*, Linn., of Europe, appears to have been offered in this country, although little known here: about 1 ft. tall, glabrous: radical lvs. oval or cordate, dentate; stem-lvs. with 3 leaflets or lobes, the terminal one large: fls. rose-colored, polygamous.

L. H. B.

VALERIANÉLLA (diminutive of Valeriana). *Valerianàceæ.* Including CORN SALAD or FETTICUS. A genus of nearly 50 species of annual, dichotomously branched herbs, with a basal rosette of entire lvs. and small white, bluish or pinkish fls. borne in terminal cymes, which form compact globular or flattish clusters. Corolla nearly regular, 5-lobed; stamens 3: fr. 3-loculed, 2 of the locules being empty. These plants are mostly native to the Mediterranean region. *V. olitoria* is the common Corn Salad and *V. eriocarpa* the Italian Corn Salad. To the account given in this work at page 376, the following may be added:

Corn Salad is both a salad plant and a pot-herb, chiefly the former. The name "Corn Salad" is probably derived from the fact that the plant grows spontaneously in the grain fields of Europe, large quantities of it being gathered in early spring. It is rather tasteless compared with lettuce, and is little known in America. Abroad it is prized as a fall and winter salad. It is a cool-season crop, grown like lettuce and matures in 6–8 weeks. Plants should stand about 6 in. apart in the row. An ounce of seed should give 2,000–3,000 plants. The following description of the varieties is derived from Vilmorin's Vegetable Garden.

olitòria, Mœnch. CORN SALAD. LAMB'S LETTUCE. FETTICUS. Fig. 2633. An "autumnal annual" herb, the seed of which ripens in April or May, soon falls to the ground, and germinates in August. The plant makes its growth in the fall and flowers the following spring. In cultivation the seed is generally sown in early spring or late summer. The plant forms a dense rosette of spoon-shaped lvs. which grow in a decussate fashion, and has an angular, forking stem bearing small bluish white fls. in terminal clusters. Eu., Orient. — The Round-Leaved variety has much shorter lvs. than the common type and they are half-erect instead of spreading, and less prominently veined. This kind is the one grown almost exclusively for the Paris market. The Large-Seeded variety is more robust than the common type and the seed is nearly twice as large. Lvs. marked with numerous secondary veins. Much grown in Holland and Germany. The Étampes variety has very dark-colored lvs., which are often undulate or folded back at the margins. Lvs. narrow, prominently veined, thicker and more fleshy than the other

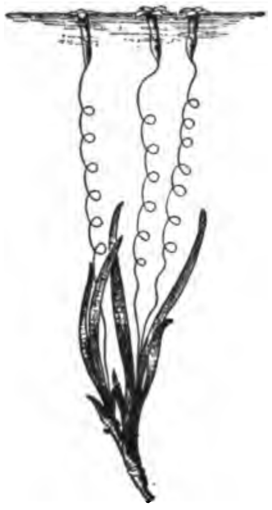
2633. Valerianella olitoria — Corn salad.

kinds and specially suited to cold weather and long distance shipment. The cabbaging variety differs from the others in forming a heart or head of fine flavor. Unfortunately it is the least productive type, but it bears shipment well.

eriocárpa, Desv. Italian Corn Salad. Distinguished from the common species by the lighter color of the lvs., which are slightly hairy and somewhat toothed on the edges towards the base. The plant is native to the south of Europe, where it is highly esteemed because it does not run to seed as quickly in a warm climate. It is undesirable for northern climates.

W. M.

VALLISNÈRIA (Antonio Vallisneri, 1661–1730, Italian naturalist). *Hydrocharidàceæ.* About 4 species of aquatic plants, including the well-known Eel-grass or Tape-grass. This is found in fresh water all over the world. It is a submerged plant with linear lvs. ½–6 ft. long, depending on the depth of the water. The lvs. originate in a tuft at the bottom of the water, and the plant spreads by runners sent out from these tufts. Eel-grass is usually found in quiet waters. It has no horticultural rank, except as an aquarium plant. Like many other aquarium plants, it has special interest for students of botany. The pistillate fls. are borne on very long spiral threads and come to the surface as shown in Fig. 2634. The staminate fls. are borne on very short stalks near the bottom of the water. At the proper time the staminate fls. break away from their stalks and rise to the surface of the water. As they float about, some of the pollen is conveyed to the pistillate fls., and in this haphazard way the blossoms are fertilized and seed is produced. Both kinds of fls. are very small, and they are borne on separate plants. Eel-grass is readily collected, or can be procured from dealers in aquarium supplies or from collectors of native plants. The plant is sometimes called "wild celery," because it is said to impart a celery-like flavor to wild ducks that feed on it. For generic characters, see Gray's Manual or Britton and Brown's Illustrated Flora.



2634. Eel-grass — Vallisneria spiralis. (Reduced.)

spiràlis, Linn. Eel-grass. Tape-grass. Fig. 2634. Hardy submerged aquatic plant: lvs. thin, linear, 5-nerved, sometimes serrate near the apex: fls. white. Aug., Sept. B.B. 1:93. R.B. 20, p. 194. V. 4:157.

Wm. Tricker and W. M.

VALLÒTA (Pierre Vallot, French botanist; wrote an account of the garden of Louis XIII in 1623). *Amaryllidàceæ.* The Scarborough Lily, *Vallota purpurea,* is a South African representative of the American genus Hippeastrum, popularly known as "Amaryllis." It is a bulbous plant with large, red, funnel-shaped, 6-lobed flowers, blooming in September and later. A pair of well-grown specimens in large pots or tubs make a showy ornament for the porch. Plants have been grown with over 50 flower trusses, each truss bearing an umbel of 4–9 fls., the individual fls. being 3–4 in. or more across. Vallota is a genus of only one species and is distinguished from Hippeastrum by the seeds being winged at the base. The tube of the flower is longer than in the typical Hippeastrums and at the base of each perianth-segment is a cushion-shaped callus somewhat different from the minute scales or distinct neck that is often found at the throat of a Hippeastrum. Other generic characters: Perianth erect; tube broadly funnel-shaped; segments equal, ascending, broad, connivent; stamens inserted below the throat: ovules many, superposed: stigma capitate: seeds black, compressed. It has recently been proposed that Vallota be considered a subgenus of Cyrtanthus. The latter is a group of about 20 species of plants with fls. of various colors and naked at the throat. Cyrtanthus proper and the subgenus Monella have beautiful pendulous fls. in umbels, but the plants are not as easy to grow as Vallota. It has been suggested that they be crossed with the more robust Vallota in the hope of combining their varied colors and pendulous grace with the strong constitution of the Vallota. Such a process would be similar to the one by which the noble race of Hippeastrum hybrids has been given to the world. Vallota is undoubtedly related to Cyrtanthus through the subgenus Gastronema, which has erect fls. and differs chiefly in the stamens. Of this subgenus *C. sanguineus* is in the trade now. The best form of Vallota seems to be the variety *magnifica.*

2635. Scarborough Lily — Vallota purpurea. (From a specimen 2 feet high)

purpùrea, Herb. Scarborough Lily. Fig. 2635. Bulb large: lvs. appearing with the fls., strap-shaped, 1½–2 ft. long, dying down in autumn: peduncle hollow, slightly 2-edged, 2–3 ft. long: fls. scarlet. Gn. 30, p. 245; 42, p. 273. R.H. 1870:50 (*V. grandiflora*). A.F. 9:211. Gng. 2:361. A.G. 1893:81.—The typical form has scapes about 1½ ft. high and blood-red fls. 2½ in. across. Var. **màjor,** Hort., is 3 ft. high and has fls. over 3 in. across. B.M. 1430 (*Amaryllis purpurea*). Var. **minor,** Hort., is smaller than the type in all parts. B.R. 7:552 (*Amaryllis purpurea,* var. *minor*). Var. **eximia,** Bull., has fls. 4 in. across, with whitish, feather-like blotches on the base of the perianth-segments. Var. **magnifica,** Hort., is probably the best and most robust form: fls. 5 in. across, with a white eye. Colors said to be brighter and more uniform than in any other kind. Gn. 30:244. G.C. III. 3:240.

W. M.

The Scarborough Lily is generally rated as a greenhouse bulb, but it can be grown by the amateur who has no glass, provided the plant can be kept over winter in a well-lighted cellar. Many people have had no success with Vallota. Such failures are generally due to the plants being kept too dry during winter. Although Baker says the leaves die down at the Cape in autumn, the plant acts like an evergreen in cultivation. Unlike the majority of bulbous plants, the Vallota should never be dried off but kept moderately moist about the roots throughout the year. The Vallota is also strongly opposed to interference with its roots. It is possible to preserve a flowering specimen in most luxuriant health for three or four years without repotting, simply by applying liquid manure to the roots occasionally during the summer. The culture of Vallota is not difficult when its peculiarities are understood. Several years are needed to work up a good plant to the specimen size. A Vallota bulb is about twice as large as a hyacinth. For the first potting use a light soil, with a little sand at the base of the bulb, and place the bulb a distance below the surface equal to its own diameter. Use as small a pot as possible at every stage; shift only when the soil is well filled with roots and be careful to break no roots when shifting to a larger pot.

The final potting is an important operation, as the plant is not to be disturbed again for three or four years. Drainage should be ample and perfect. It is essential that the potting soil be of a strong, permanent nature and rich in plant-food. A good compost consists of turfy loam, fibrous peat and old cow manure in equal parts. Add a little sand and charcoal. Avoid repotting until it is strictly necessary, and do so only when it is necessary to increase the number of plants or when there is danger of the roots breaking the pot. For amateurs the best time to repot the plants is directly after the flowering period. Use the greatest care in handling the roots. Allow the bulbs to project a little beyond the surface.

Some gardeners prefer to repot Vallota in June or July when root action has started, but before the flower stems have pushed up. Vallota likes full sunshine at all times of the year. The plant will stand a few degrees of frost in winter. Beware of over-potting; it is better to have the bulbs crowd one another out of the pot. Amateurs sometimes raise Vallotas in the window-garden, one bulb in a 6-inch pot with 1 or 2 flower-stalks, but a large specimen is well worth years of care. The Scarborough Lily has been cultivated by rich and poor for over a century. Its popular name is supposed to have been derived in the same way as the Guernsey Lily,—a Dutch bark having been wrecked off the coast of England, some bulbs washed ashore and become established as garden plants. Vallota is considerably grown for the London market, and it is said that some growers succeed in blooming their plants twice the same year, in winter and summer. At the Cape, the species is said to be native to peat bogs, which fact would account for the special winter treatment which it needs. In California the plant blooms at various times of the year.

MICHAEL BARKER.

VANCOUVÈRIA (after Capt. George Vancouver, commander of the Discovery in the voyage to our northwest coast in 1791-95). *Berberidàceæ.* A genus of 3 species of low, hardy perennial herbs native to our Pacific slope. Shade-loving plants, with slender creeping rootstocks and radical 2-3-ternately compound lvs. somewhat like maidenhair or rue and rather small white or yellow flowers in an open panicle on a naked scape. Sepals 6, in 2 series, obovate, petal-like, reflexed, soon falling; petals 6, linear-spathulate; stamens 6: follicle oblong, membranous, unequally 2-valved: seeds arillate. Vancouverias demand a rich soil in rather shady positions. They are not showy plants, but have foliage of an elegant and refined type.

A. *Lvs. thin, membranous: fls. whitish.*

hexándra, Morr. & Decne. About 1 foot high: rootstock woody, slender: lfts. roundish, mostly angulately 3-lobed and cordate: scape naked or 1-lvd.: panicle simple or loose-branched: fls. white or cream-colored. May, June. Coniferous woods, Brit. Col. to N. Calif. near the coast. Gn. 30, p. 263.

AA. *Lvs. rather thick: fls. yellow.*

chrysántha, Greene (*V. hexándra*, var. *àurea*, Rattan). About 1 ft. high: lfts. evergreen, sub-3-lobed, usually whitened and pubescent beneath: inflorescence subracemose: fls. somewhat larger than in *V. hexandra.* Offered by Pilkington & Co., of Oregon, in 1892.

F. W. BARCLAY.

VÁNDA (native name in India). *Orchidàceæ.* One of the most attractive genera of East Indian orchids, nearly all species having large, handsome flowers. In habit they are dwarf and short-stemmed or tall and branched, sometimes climbing to a considerable height. The erect species form compact plants, with stems and branches well clothed with 2 opposite rows of leaves. Species like *V. teres* have a loose, straggling habit. Lvs. flat or channeled and keeled or terete, sometimes fleshy and deeply channeled; apex pointed, lobed or toothed: fls. in racemes from the axils of the lvs.; sepals and petals similar, spreading, narrowed at the base almost to a claw; labellum firmly united to the column, spurred, lateral lobes small, erect, middle lobe spreading; pollinia on a common stipe. About 20 species, natives of India and the Malay Islands.

HEINRICH HASSELBRING.

Notwithstanding the various conditions surrounding the different species of Vanda in their natural habitats, the plants may nearly all be cultivated successfully under the same general treatment. When a general collection is grown a house of east and west exposure will be found best suited to the wants of Vandas. The plants require plenty of light and do not need any shade from November until the middle of February. A house of east and west aspect will require less shading during late fall and early spring than one of southern exposure, and there will be fewer ill effects from direct solar heat at all times. From February until November shading will be necessary, but it should never be too heavy or black spot is likely to appear. The winter temperature should range from 60° to 65° F. by night and 70° to 75° by day, with a gradual increase of ten degrees during the summer months. A few degrees more with solar heat and ventilation will do no harm.

The atmosphere must be kept moist by damping the benches and paths freely once or twice a day, and ventilation should be given whenever possible in greater or less degree according to outside conditions. Especially during wet, cheerless weather is ventilation important, even if fire heat has to be applied to retain the desired temperature. Vandas may be grown well in either pots or baskets, but the latter are preferable, as they admit air more freely to the roots, whereby they are not so liable to decay from overwatering during severe weather.

2636. Vanda cærulea (×⅓).

The best potting or basketing material consists of chopped live sphagnum moss freely interspersed with large pieces of charcoal. This material should be pressed in rather firmly about the roots, leaving a convex surface when finished. A plentiful supply of water is essential at all seasons with copious syringing over the foliage in bright weather. The compost should never be allowed to remain dry for a long time.

V. tricolor and species like it grow very well among foliage plants in the warmhouse, where their large aërial roots, which are freely emitted from the sides of the stems, may ramble among the foliage and thereby retain .moisture a long time after syringing. A few species, such as *V. Amesiana*, *V. cærulea* and *V. Kimballiana*, with one or two other alpine species, require about ten degrees cooler temperature, but otherwise similar treatment to other species of the genus.

Stock is increased by removing a foot or more of the leading growth with a sharp knife, allowing several roots to remain attached to each growth and basketing them in the usual manner. These new pieces should be frequently syringed overhead until they become established or they are likely to shrivel. The old stems will nearly always send out several new growths.

The principal insect enemies to Vandas are several species of scale, which breed fast in a dry atmosphere. They can be kept in check by syringing with strong tobacco water and by sponging the plants with a 20 per cent solution of alcohol.

R. M. Grey.

INDEX.

Amesiana, 15.
Andersoni, 17.
Bensoni, 8.
Boxalli, 1, 5.
Cathcarti, 19.
cærulea, 6, 11.
cærulescens, 1.
Corningii, 10.
Denisoniana, 7.
densiflora, 14.
grandis, 10.
Hookeriana, 18.
illustre, 14.
insignis, 9.
Kimballiana, 16.
lamellata, 4.
limbata, 12.
Mariottiana, 13.
Parishii, 13.
parviflora, 2.
Patersoni, 10.
Robinsoniana, 10.
Roxburghii, 11.
Sanderiana, 20.
Schrœderiana, 9.
spathulata, 3.
splendens, 10.
suavis, 10.
superba, 10.
teres, 17.
tessellata, 11.
tricolor, 10.
Veitchii, 10.

- A. *Labellum spurred.*
  - B. *Lvs. flat, or channeled and keeled, toothed or lobed at the apex.*
    - C. *Racemes loose: labellum with lateral lobes.*
      - D. *Fls. 1–1½ in. across.*
        - E. *Color blue* .... 1. **cærulescens**
        - EE. *Color yellow* .... 2. **parviflora**
          3. **spathulata**
        - EEE. *Color white or pale yellow, but streaked and shaded with brown* .... 4. **lamellata**
          5. **Boxalli**
      - DD. *Fls. 2 in. or more across (sometimes less in Nos. 8 and 11).*
        - E. *Color blue*.................. 6. **cærulea**
        - EE. *Color white*....... .... 7. **Denisoniana**
        - EEE. *Color white or yellowish, but spotted with purple or brown.*
          - F. *Middle lobe of the labellum dilated, reniform.* 8. **Bensoni**
            9. **insignis**
          - FF. *Middle lobe slightly dilated, truncate or emarginate.*
            - G. *Apex emarginate or 2-lobed*..............10. **tricolor**
              11. **Roxburghii**
            - GG. *Apex truncate and obscurely mucronate*...12. **limbata**
          - FFF. *Middle lobe shorter than the sepals, flabelliform*.13. **Parishii**
    - CC. *Raceme dense, cylindrical: labellum without lateral lobes*..14. **densiflora**
  - BB. *Lvs. semi-terete and deeply channeled, pointed*.............15. **Amesiana**
    16. **Kimballiana**
  - BBB. *Lvs. terete*.......................17. **teres**
    18. **Hookeriana**
- AA. *Labellum not spurred* ....19. **Cathcarti**
  20. **Sanderiana**

1. **cærulèscens**, Griff. Stem 1–2 ft. high: lvs. 5–7 in. long, deeply channeled, truncate and 2-lobed at the apex: racemes many, slender and pendulous, each bearing about 12 fls.: fls. 1 in. across; sepals and petals obovate, subacute, undulate or twisted, pale lilac-blue; labellum shorter than the sepals, middle lobe cuneate-obovate, with a delicate 2-lobed tip, violet with fleshy dark blue ridges, side lobes small, dark blue. Spring. Burma. B.M. 5834. F.M. 1877:256. G.C. 1870:529.—Color varies from blue to nearly white. Var. **Bóxalli**, Reichb. f. Fls. pale violet or nearly white: disc of the labellum deep violet with white lines on the sides. B.M. 6328.

2. **parviflòra**, Lindl. Stem 4–6 in. high: lvs. strap-shaped, 4–8 in. long, unequally obtusely 2-lobed: racemes erect, many-fld.: fls. small, yellow; sepals and petals obovate-spatulate; labellum shorter than the sepals, middle lobe obovate, dilated, truncate and 2-lobed at the apex, yellow below, white above, spotted and dashed with purple and having thick fleshy ridges. Himalayas. B.M. 5138 (as *Aërides Wightianum*).

3. **spathulàta**, Spreng. Stem 2 ft. high: lvs. 2–4 in. long, obtusely 2-lobed: peduncle robust, 12–18 in. tall, few-fld.: fls. 1¼ in. across, golden yellow; sepals and petals oblong-spatulate, flat; labellum as long as the sepals, clawed, side lobes very small, broadly obovate, middle lobe sub-orbicular, obscurely 3-fid. Ceylon, India.

4. **lamellàta**, Lindl. Lvs. channeled, leathery, obliquely and acutely bifid at the apex: fls. pale yellow, stained with red; sepals and petals obovate, obtuse, undulate, the lower sepal larger and somewhat incurved; middle lobe of the labellum obcuneate, retuse, auriculate, having a pair of red elevated plates and 2 red tubercles just below the apex. Aug.–Nov. Philippines.

5. **Bóxalli**, Reichb. f. (*V. lamellàta*, var. *Bóxalli*, Reichb. f.). Stem tall, with long recurved lvs.: raceme longer than the lvs., bearing 14–20 fls.: sepals white, with the lower margins of the lateral pair sepia-brown; petals white, with violet streaks which are also found on the sepals, pandurate with large lamellæ and square auricles, mostly lilac. Nov., Dec. Philippines. G.C. II. 15:87. Gn. 19:574.

6. **cærùlea**, Griff. Fig. 2636. Stem 1–2 ft. high: lvs. rigid, linear, 6–10 in. long, obliquely truncate and toothed at the tip: raceme 1–2 ft. long: fls. 3–4 in. across, pale blue; lateral sepal obovate; petals broadly obovate, clawed; labellum less than one-third the length of the sepals, dark blue, linear-oblong, side lobes small, rounded, middle lobe with 2 thickened ridges. Late autumn. India. F.S. 6:609. I.H. 7:246. Gn. 21:254; 31, p. 566; 47, p. 145; 50, pp. 59 and 418; 52, p. 410. R.B. 17:265. G.C. III. 3:41; 7:17; 11:272. Gng. 3:135. G.F. 3:77. A.F. 6:685. F.R. 1:371. R.H. 1881:290 (var. *grandiflora*).—This is considered to be one of the best species in cultivation. The fls. are often tessellated.

7. **Denisoniàna**, Benson & Reichb. f. Stem short: lvs. linear, 6–10 in. long, recurved, deeply notched at the apex: peduncles short, stout, bearing 4–6-fld. racemes: fls. white, 2 in. across; sepals and petals waved and twisted, the lateral sepals broadly obovate, falcate; petals clawed, spatulate; labellum longer than the sepals; side lobes large, subquadrate; middle lobe panduriform, with 2 orbicular, diverging, terminal lobes. Summer. Burma. B.M. 5811. I.H. 19:105. F. 1869, p. 250. G.C. II. 24:105. A.F. 6:607.

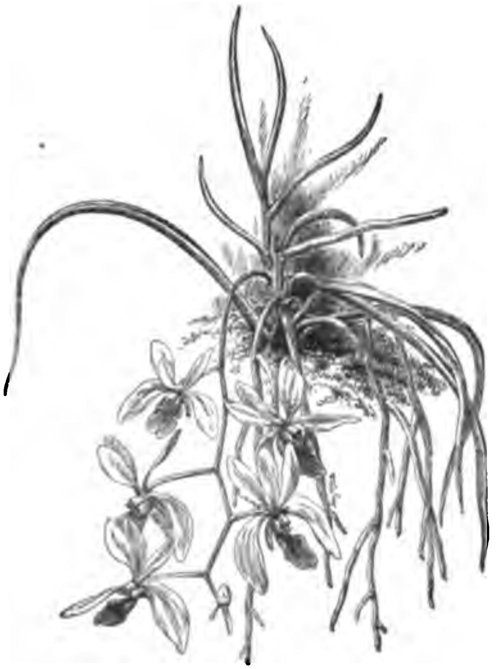
8. **Bénsoni**, Batem. Stem about 1 ft. high, very leafy: lvs. linear, leathery, 6–8 in. long, obliquely toothed at the apex: fls. 2 in. across, 10–15 in a raceme, 1–1½ ft. long; sepals and petals obovate, obtuse, clawed, white outside, yellowish green with numerous brown dots inside; labellum violet, with white spur and side lobes, middle lobe terminating in a reniform, bifid apex. Summer. Burma. B.M. 4612. F.S. 22:2329. G.C. 1867:180.

9. **insígnis**, Blume. Stem erect: lvs. linear, 10 in. long, apex with 2 or 3 teeth: raceme rather short, 6–10-fld.: fls. 2–2½ in. across; sepals and petals obovate, fleshy, the petals narrower, ochraceous brown, with darker brown blotches inside, almost white on the outside; labellum pandurate, the apical lobe being broadly reniform, concave, white tinted with rose. Summer. Malaya. B.M. 5759. Gn. 25:168.—Var. **Schrœderiàna** has yellow fls. with a white labellum. Gn. 25:168.

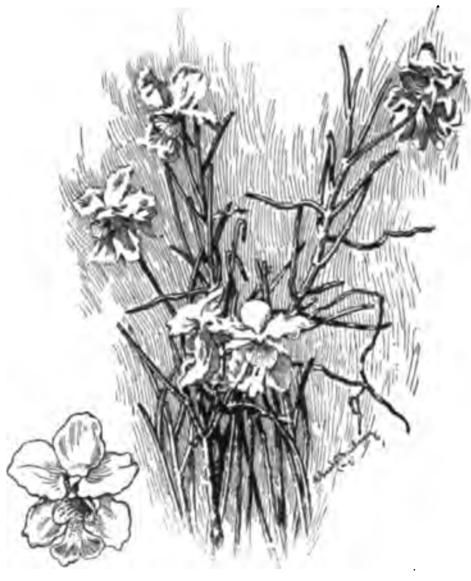
10. **tricolor**, Lindl. Stem branched, tall, erect and leafy: lvs. strap-shaped, 10–12 in. long, channeled: raceme drooping, longer than the lvs.: fls. 2–3 in. across; sepals obovate, attenuated at the base, yellow with numerous brownish crimson spots; petals similar to the sepals in form and color but narrower; labellum about as long as the sepals, lateral lobes small, rounded; middle lobe lyrate, notched, purple, with elevated lines. F.S. 6:641. I.H. 42, p. 161. B.M. 4432.—Var. **suàvis**, Hort. (*V. suàvis*, Lindl.). Ground color of the fls. white; sepals and petals spotted with purple; labellum deep purple. Fls. irregular from March to May. Java. B.M. 5174. F.S. 5, p. 510; 6:641. Gn. 3, p. 103; 23, p. 134 (as *V. tricolor*); 31, p. 242; 47:1010. I.H. 42, p. 162. G.C. II. 22:237 (var.); III. 7:133 and 135. Var. **Vèitchii**, Hort. Fls. with rather large spots of deep rose; labellum deep rose. R.B. 20:145. Var. **Pátersoni**, Hort. Sepals and petals creamy white, heavily spotted with brown; labellum magenta-crimson. Gn. 23:375. Var. **Córningii**, Hort. Sepals and petals bright yellow, spotted with deep crimson and bordered with rose-purple on both sides: labellum deep violet. Vars. **Robinsoniàna**, **grándis**, **spléndens** and **supérba** are also advertised.

11. **Róxburghii**, R. Br. (*V. tessellàta*, Hook.). Stem 1–2 ft., climbing: lvs. narrow, complicate, 6–8 in. long, 2–3-toothed at the apex: racemes erect, 6–8-fld.: fls. greenish yellow, tessellated with olive-brown inside, white outside; sepals and petals subequal, clawed, obovate, waved; labellum nearly as long as the sepals, lateral lobes small, acute, middle lobe panduriform, violet, truncate. May–Aug. Bengal. B.R. 6:506. B.M. 2245. F.S. 2:2; 6, p. 330. I.H. 32:579 (var. *rubra*). P.M. 7:265.—Var. **cærùlea** is advertised.

12. **limbàta**, Blume. Stem about 3 ft. high: lvs. linear, keeled, 6–8 in. long, unequally bifid at the apex: racemes 10–12-fld., 6–8 in. long on peduncles of equal length: fls. 2 in. across; sepals and petals spatulate, bright cinnamon, tessellated, bordered with golden yellow, white suffused with lilac outside; middle lobe of the labellum oblong-pandurate, truncate, mucronate, pale lilac. June, July. Java. B.M. 6173.


2637. Vanda Kimballiana (× ¼).

13. **Párishii**, Reichb. f. Stem very short: lvs. few, 8–10 in. long, 2–3 in. wide, obtusely 2-lobed: raceme drooping, 6–8-fld., on a short peduncle: fls. 2 in. across, fleshy, greenish yellow, freely spotted with reddish brown; sepals broadly ovate-oblong; petals orbicular; labellum one-half as long as the sepals, white striped with orange at the base; lateral lobes rounded, middle lobes flabelliform. Summer. Moulmein, India.—Var. **Mariottiàna**, Reichb. f. Sepals pale mauve with numerous darker blotches outside, petals mauve; both sepals and petals are mauve inside; labellum, white at base, with yellow spots and mauve lines.


2638. Vanda teres (detached flower × 1·5).

14. **densiflòra**, Lindl. (*Saccolàbium gigantèum*, Lindl.). Stem short, thick: lvs. very thick, 6–12 in. long, notched: raceme dense, cylindrical, about as long as the lvs., nodding: sepals white, cuneate-ovate, subacute; petals narrower, with few purple spots at the base; labellum cuneate, obtusely 3-lobed, with two pubescent ridges at the base, terminal lobes bright shining purple. Winter. Burma. B.M. 5635. F.S. 17:1765.—Var. **illústre**, Reichb. f. Raceme and fls. larger: sepals and petals spotted with purple; labellum bright purple. I.H. 31:517.

15. **Amesiàna**, Reichb. f. Stem very short and stout: lvs. fleshy, rigid, almost terete, with a groove down the center, 6–12 in. long: raceme simple or branched, erect, 1–2 ft. long and bearing 20–80 fls.: fl. 1½ in. across, white, with rose-colored ridges on the labellum, sepals and petals ovate-oblong, obtuse; labellum with a broadly cuneate, undulate middle lobe, having 5 ridges converging into a reflexed callus, side lobes small, rounded. Flowers at various seasons. India. B.M. 7139. J.H. III. 29:491; 33:271. A.F. 6:441.

16. **Kimballiàna**, Reichb. f. Fig. 2637. Stem 6 in. high, probably climbing to a great height: lvs. 6–10 in. long, terete, with a deep, narrow furrow: peduncle slender, 6–10 in. long, bearing a drooping raceme 8–10 in. long: fls. 2–3 in. across; petals and dorsal sepal obovate-spatulate, lateral sepals very much larger, oblong, falcate, all pure white; labellum smaller than the lateral sepals, middle lobe orbicular, notched, rose-purple with darker veins, margin erosely toothed, lateral lobes small, yellow; spur 1 in. long, curved. Autumn. Burma. B.M. 7112. Gn. 37:747. R.H. 1897:352. Gt. 45:1428 and p. 338. J.H. III. 20, p. 41; 29, p. 53. G.C. III. 6:335; 17:69. A.G. 1891:89.

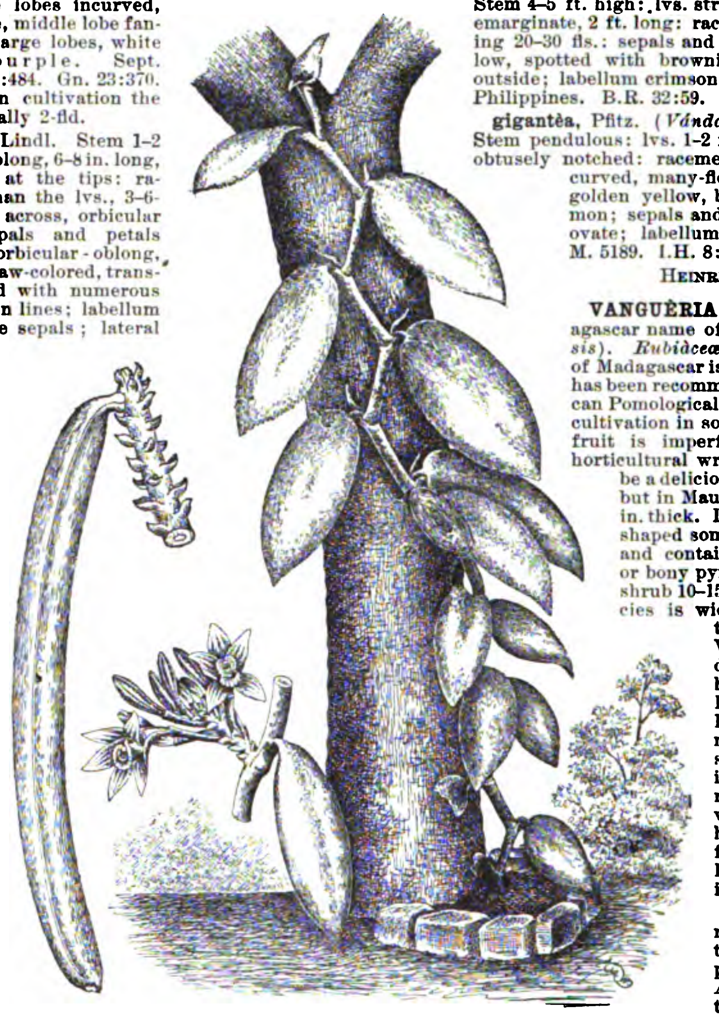
17. **tères**, Lindl. Fig. 2638. Stem long, climbing: lvs. terete, 6–8 in. long: peduncle 6–12 in. long, bearing a 3–6-fld. raceme: fls. 4 in. across; sepals nearly orbicular, white tinged with rose; petals a little larger, deep rose; side lobes of the labellum broad, incurved, yellow spotted with crimson, middle lobe exceeding the sepals, fan-shaped, reniform, purple or rose-colored. May–

Sept. Burma. B.M. 4114. B.R. 21:1809. P.M. 5:193. R.H. 1856:421. Gt. 43:1404. G.C. II. 20:273; III. 27:307. S.H. 2:385. Gn. 42:876.—A plant of straggling habit, but with very beautiful fls. Var. **Ándersoni**, Hort., has fls. larger and more highly colored.

18. **Hookeriàna,** Reichb. f. Stem and lvs. terete, as in *V. teres*, but the latter only 2–3 in. long, and slender: fls. 3–5 in. across; dorsal sepal and petals white, dotted with purple; lateral sepals narrower, oblong or somewhat obovate, white; labellum as large as the rest of the flower, side lobes incurved, white and purple, middle lobe fan-shaped, with 3 large lobes, white spotted with purple. Sept. Borneo. I.H. 30:484. Gn. 23:370. G.M. 40:645.—In cultivation the racemes are usually 2-fld.

19. **Cáthcarti,** Lindl. Stem 1–2 ft.: lvs. linear-oblong, 6–8 in. long, unequally bifid at the tips: racemes longer than the lvs., 3–6-fld.: fls. 2½ in. across, orbicular in outline; sepals and petals nearly equal, orbicular-oblong, concave, pale straw-colored, transversely streaked with numerous narrow red-brown lines; labellum shorter than the sepals; lateral lobes quadrate, incurved, white with red streaks; middle lobe reniform, margin white, slightly crenate, center thick, yellow with a crenate border. Spring. Himalaya. B. M. 5845. F. S. 12:1251. G. C. 1870:1409. Gn. 19, p. 351; 33, p. 224; 42, p. 276.—Found near waterfalls, where it is always kept damp.

20. **Sanderiàna,** Reichb. f. Stem very leafy: lvs. rigid, fleshy, recurved, 1 ft. long, strap-shaped, truncate, with 2–3 teeth at the apex: raceme bearing about 12 fls. each 5 in. across, with the broad sepals and petals overlapping: sepals orbicular, the dorsal one smaller, pale lilac, dotted at the base, the lower pair tawny yellow veined and tessellated with brownish crimson; petals smaller, rhomboid obovate, colored like the dorsal sepals; lateral lobes of the labellum forming a cup-like base, middle lobe subquadrate, reniform, much smaller than the sepals, dull crimson. Sept. Philippines. B. M. 6983. I.H. 31:532. R.H. 1885:372. Gn. 25:426; 32, p. 399; 49, p. 88; 50:480. J.H. III. 35:55. G.C. II. 203:440. Gng. 6:115.—A very remarkable free-flowering species.



2639. Vanilla plant.—Vanilla planifolia.
The detached flowers were about 4 inches across. Drawn in Jamaica.
(The pod × ⅓.)

Synonyms and imperfectly known species: *V. Bàtemanni*, Lindl. = Vandopsis lissochiloides.—*V. Cathartica*, Hort., is presumably an error for V. Cathcartii (No. 19 above).—*V. gigantèa*, Lindl. = Vandopsis gigantea.—*V. Lowei*, Lindl. = Renanthera Lowei.—*V. Nièmanii.*—*V. præmórsa.*

HEINRICH HASSELBRING

VANDÓPSIS (like *Vanda*). *Orchidàceæ.* Includes 2 or 3 species which until recently have been united with Vanda or with Stauropsis. They are distinguished from allied genera by the labellum, which is firmly united with the column, not spurred, concave at the base, with the terminal lobe compressed laterally. In appearance these plants resemble robust Vandas, with which they are usually classed for horticultural purposes. Treatment the same as for Vanda.

lissochiloides, Pfitz. (*Vánda Bàtemanni*, Lindl.). Stem 4–5 ft. high: lvs. strap-shaped, obliquely emarginate, 2 ft. long: raceme tall, erect, bearing 20–30 fls.: sepals and petals obovate, yellow, spotted with brownish crimson, purple outside; labellum crimson-purple. July–Sept. Philippines. B.R. 32:59. F.S. 18:1921.

gigantèa, Pfitz. (*Vánda gigantèa*, Lindl.). Stem pendulous: lvs. 1–2 ft. long, thick, flat, obtusely notched: raceme 10–15 in. long, decurved, many-fld.: fls. 3 in. across, golden yellow, blotched with cinnamon; sepals and petals spatulate-obovate; labellum white. Burma. B. M. 5189. I.H. 8:277. R.H. 1874:290.

HEINRICH HASSELBRING.

VANGUÈRIA (*Voa-Vanguer*, Madagascar name of *V. Madagascariensis*). *Rubiàceæ.* The VOA VANGA of Madagascar is a tropical fruit that has been recommended by the American Pomological Society as worthy of cultivation in southern Florida. The fruit is imperfectly described in horticultural writings. It is said to be a delicious berry ¾ in. thick, but in Mauritius it becomes 1⅓ in. thick. It is a globose drupe, shaped something like an apple and contains 5 large "stones" or bony pyrenes. The plant is a shrub 10–15 ft. high. The species is widely spread in the tropics of the Old World. It was introduced to American horticulture by A. I. Bidwell, of Orlando, Fla. In 1887 Van Deman reported that the shrub grew exceedingly well, sprouting readily from the roots when frozen down. It has probably never fruited in America. It grows readily from imported seeds.

Vangueria is a genus of 20 species native to the warmer parts of Asia and Africa. Shrubs or trees, sometimes spiny or somewhat climbing in habit: lvs. opposite or rarely pseudo-verticillate in 4's, oval: fls. small, white or greenish in axillary clusters; calyx 5- or 4-lobed, lobes deciduous or rarely persistent; corolla hairy or not outside, usually furnished inside with a ring of deflexed pilose hairs; lobes spreading or reflexed; stamens 5, rarely 4; disc fleshy or depressed: ovary 5–3-loculed; stigma capitate: ovules solitary: fr. drupaceous; pyrenes 5–3 in number or putamen 5–3-loculed.

Madagascariénsis, J. F. Gmel. (*V. édulis*, Vahl.) Glabrous shrub, 10–15 ft. high: lvs. very large, oblong, obtuse or acute, membranous, short-petioled: fls. in copious, peduncled, axillary dichotomous cymes; corolla funnel-shaped, ¼ in. long, with 5 spreading deltoid teeth. Madagascar.

W. M.

VANILLA (Spanish, *little sheath* or *pod*). *Orchidàceæ.* Vanilla. Climbing orchids whose branched stems ascend to a height of many feet. The nodes bear leaves or scales and aërial roots in alternate arrangement. Fls. in axillary racemes or spikes, without an involucre at the top of the ovary; sepals and petals similar, spreading; labellum united with the column, the limb enveloping the upper portion of the latter; column not winged. About 20 species in the tropics.

The most important species is *V. planifolia*, the Vanilla of commerce. It is a native of Mexico, but is now widely cultivated in the West Indies, Java, Bourbon, Mauritius and other islands of the tropics, its chief requirement being a hot, damp climate. The plants are propagated by cuttings varying in length from 2 to about 12 ft., the longer ones being the more satisfactory. These are either planted in the ground or merely tied to a tree so that they are not in direct connection with the earth. They soon send out aërial roots, by which connection with the soil is established. They are usually trained on trees so that the stems are supported by the forked branches, but posts and trellises are also used as supports. In most places where Vanilla culture is carried on pollinating insects are lacking and the flowers must be pollinated by hand. Plants bear their first fruit about three years after setting. They then continue to fruit for 30 or 40 years, bearing up to 50 pods annually. The Vanilla pods are picked before they are ripe, and dried. The vanillin crystallizes on the outside. For a full description of Vanilla culture and methods of curing the pods, see Bull. No. 21, U. S. Dept. of Agriculture, Div. of Botany, by S. J. Galbraith. Vanillin is also made from other sources by chemical means. The genus was monographed in 1896 by R. A. Rolfe in Journ. Linn. Soc., vol. 32.

planifòlia, Andrews (*V. aromàtica*, Willd. in part). Fig. 2639. Common Vanilla. Vanilla Bean (from the pods). Tall climbing herbs with stout stems: lvs. thick, oblong-lanceolate, acuminate, with short, stout petioles: fls. yellow, large, in axillary racemes of 20 or more blossoms; sepals and petals oblanceolate; labellum trumpet-shaped, with small, reflexed, crenulate lobes. Winter. A native of Mexico but widely cultivated throughout the tropics and in greenhouses. B.M. 7167. L.B.C. 8:733. G.C. III. 25:213. Gn. 57, p. 35.

aromàtica, Sw. Stem angular: lvs. broadly ovate, with a bluntish point, contracted at the base: fls. greenish and white. Jamaica, Colombia, Trinidad.

Heinrich Hasselbring.

VANILLA PLANT. *Trilisa odoratissima;* see, also, *Vanilla*, above.

VARIEGATION. This term is usually applied to a class of variations, especially in leaf coloration, in which the leaves become striped, banded, spotted, blotched, etc., with yellow, white, red and various other colors in connection with the normal green of other portions of the leaves. In the case of yellow and white variegation, the term albinism is sometimes used, especially when the plants are largely marked with white or yellow, as in *Abutilon Sellowianum*, *Pelargonium zonale*, and variegated forms of *Euonymus Japonicus*, *Hydrangea hortensis*, *Hedera Helix*, *Panax Victoriæ* and others.

Among the dracænas, caladiums and codiæums, besides the white variegation, there are developed beautiful reds, pinks, yellow, etc. As a rule, the term variegation is not used in cases of color variation in which only the surface of the leaf is involved, as in many of the begonias, sansevierias (*S. Guineensis* and *S. Zeylanica*), *Alocasia cuprea*, *Cissus discolor*, and others. Fig. 2641. In many such plants the markings are due in part to hairs, scales, or air in the cuticle or epidermal cells, as in Sansevieria and Begonia. In some begonias, many varieties of Calathea (as *C. ornata*, var. *albo-lineata*), etc., the epidermal cells develop decided and definite color variation, though the changes do not usually involve the mesophyll or inner cells of the leaf. In some genera, however, especially Calathea, we find all gradations between purely epidermal variegation and changes involving the deeper layers of the leaf, as in *C. Veitchii* and *C. Makoyana*. The same is true of many other genera. Different kinds of variegation are shown in Figs. 2640–1.

True variegations may be distinguished from ordinary colorations, bleaching, chlorosis, etc., by the fact that the colored areas are usually quite sharply defined. They do not gradually blend into each other, but have definite boundaries. Cells in the variegated areas are found, as a rule, to contain the same chlorophyll bodies (chromatophores) as the ordinary green cells of the plant. However, in the variegated parts, the green color is not developed, and the chromatophores are often smaller or are somewhat swelled and vacuolate. In the case of chlorosis, due to the lack of iron, or yellowing due to the lack of light, a leaf will quickly develop its normal color if given the proper conditions. This is not the case, however, in variegated leaves. While the intensity of whatever color the chromatophores may have can be varied by light and food, a variegated cell can never be changed by these means to a normal cell.

2640. Variegation in Abutilon.

The chlorophyll granules (chromatophores) appear to have lost entirely, in many cases, the power to make starch and sugar from the carbonic acid gas in the air, and in other cases this power is very greatly reduced. In practically all cases, however, when the chromatophores are not destroyed, they retain the power to convert sugar into starch and they thus store up starch in their tissues from the sugar manufactured by the healthy cells of the leaf.

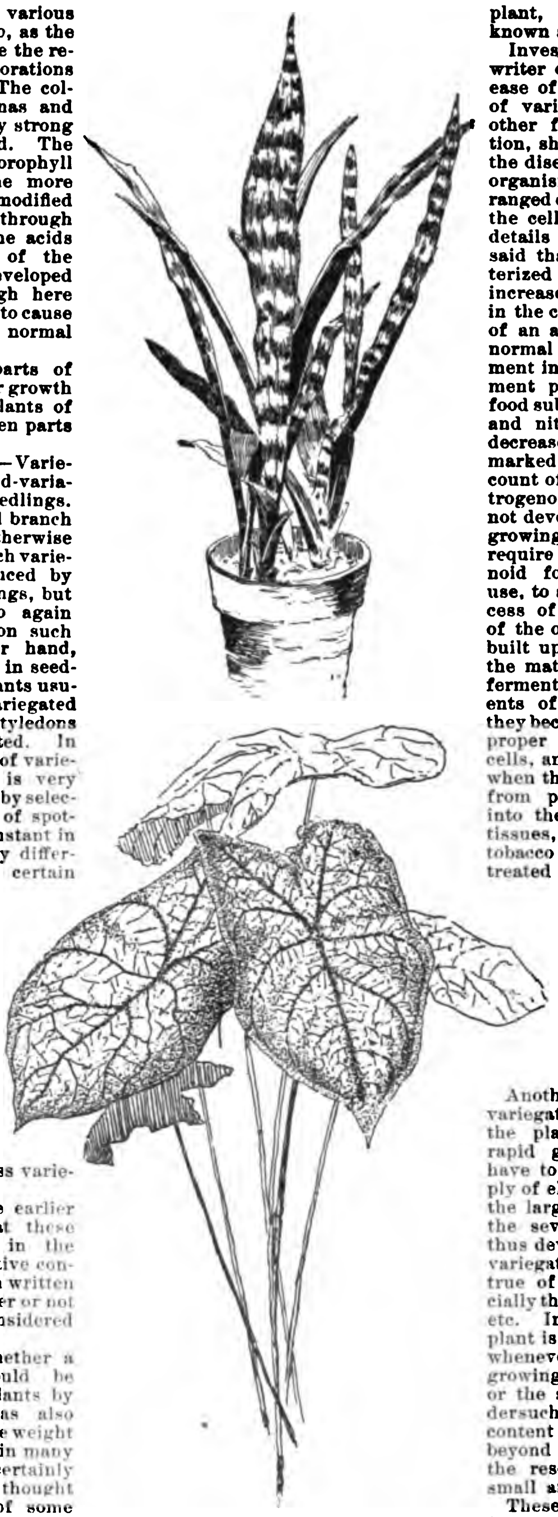
White or albino variegation is of course due to a lack of any coloring in the chromatophores, and sometimes to the entire absence of these bodies. The cells seem to have lost completely the power of making chlorophyll. These albicant variegations are to be looked upon as the more extreme forms of variegation, and usually arise through a feeble or atrophied condition of the plant. Seedlings raised from parents both of which are variegated in this way are usually very weak. High feeding and favorable conditions of growth, while they will not cause a variegated plant to return to its normal condition, will often stimulate the development of a normal green shoot that takes most of the nourishment and thus causes the starvation and disappearance of the albicant parts. In other cases, as in codiæums, modified chlorophyll is made. Large yellowish oil-like drops occur in the substance of the chromatophores, and the various changes that these undergo, as the leaf becomes older, produce the remarkable and beautiful colorations of this group of plants. The coloration here, as in dracænas and caladiums, is intensified by strong light and nourishing food. The more of the modified chlorophyll there is produced and the more rapid the changes in the modified chlorophyll brought about through the action of light and the acids and oxidizing ferments of the leaves, the more highly developed will be the colors, though here again high feeding is likely to cause the plant to revert to its normal condition.

Variegated plants or parts of plants are usually of slower growth and smaller than green plants of the same variety or the green parts of the same plant.

Causes of Variegation.—Variegation occurs either by bud-variation or by variations in seedlings. In the former, a variegated branch is likely to appear on an otherwise perfectly normal plant. Such variegations are easily reproduced by budding, grafting or cuttings, but generally do not develop again from seeds produced on such branches. On the other hand, when variegation develops in seedlings, the seeds of such plants usually give a number of variegated individuals, even the cotyledons being sometimes affected. In some cases the proportion of variegated plants from seeds is very large and can be increased by selection. As a rule, the form of spotting or marking is not constant in seedlings, often being very different from the parent. In certain groups of plants, which have for many years been selected on account of the horticultural value of these markings, the variegated condition has become almost a fixed feature of the plant, as in dracænas, caladiums, codiæums, etc. While the plants of these genera are not usually propagated from seeds, still when they are so propagated, a large number of seedlings show more or less variegation.

Darwin and many of the earlier investigators believed that these variations were started in the plant by unfavorable nutritive conditions, and much has been written on the subject as to whether or not variegations should be considered as diseased conditions.

The question as to whether a variegated condition could be transmitted to normal plants by budding and grafting has also been much disputed, but the weight of evidence indicates that in many cases such transmission certainly takes place. This has been thought to indicate the presence of some micro-organism, living either parasitically or symbiotically in the plant, and causing the changes known as variegation.



2641. Kinds of variegation. Sansevieria above and Caladium below.

Investigations conducted by the writer on the so-called mosaic disease of tobacco, which is a form of variegation, and also on many other forms of ordinary variegation, show quite conclusively that the disease is not caused by micro-organisms, but is due to a deranged condition of the nutrition of the cells. Without going into the details of the matter, it may be said that the condition is characterized physiologically by a marked increase in the oxidation processes in the cells, caused by the presence of an abnormal amount, or an abnormal activity, of oxidizing ferment in the protoplasm. This ferment prevents the movement of food substances, especially starches and nitrogenous materials. The decrease of the latter is especially marked, and it is probably on account of the lack of sufficient nitrogenous food that the cells do not develop normally. The young growing buds and dividing cells require highly organized albuminoid foods. They do not make use, to any extent, during the process of growth and cell division, of the ordinary nitrates which are built up into nitrogenous foods by the mature cells. The oxidizing ferments, though normal constituents of all cells, prevent, when they become excessively active, the proper nutrition of the dividing cells, and it is a curious fact that when these ferments are extracted from plant tissues and injected into the young buds of healthy tissues, they will, in the case of tobacco at least, cause the buds so treated to develop into variegated shoots. The ferment in question passes readily through the cell-walls of the plants and it thus becomes evident how such changes could be transmitted by grafting and budding, though no parasitic organisms of any kind are connected with the matter.

Another method of producing variegation of tobacco is by cutting the plant back severely during rapid growth. The new shoots have to develop with a small supply of elaborated nitrogenous food, the larger part being removed in the severe cutting back. Shoots thus developed nearly always show variegation. The same thing is true of many other plants, especially the potato, tomato, mulberry, etc. In fact, it appears that a plant is likely to show variegation whenever it is so treated that the growing buds or the forming buds, or the seeds, have to develop under such conditions that the ferment content of the cells is increased beyond the normal amount, and the reserve foods stored are in small amount.

These changes must, therefore, be considered as pathological in their nature, as the vitality and vigor of the plants are reduced as a result. It is further evident that the initial causes of variegation may be quite diverse, some of the most usual being seed of low vitality; unsuitable nourishment, especially a lack of elaborated nitrogen; rapid growth in very moist soil; severe injury to the roots during a period of rapid growth of the upper parts of the plant; severe cutting back, etc.

Though started at first through the influence of environment, variegation, when of value horticulturally, has in many cases been increased and fixed by selection till it has become almost a specific character in some groups of plants.

Autumnal Coloration.—A word might be said in this connection regarding autumnal coloration. The production of color in autumn foliage is, as is well known, due in part to the gradual destruction of the chlorophyll when the leaves have reached maturity and approach the period of death, and in part to the action of acids on anthocyanin as described below. Many of the destructive changes which take place in the chlorophyll are oxidation processes, the same as occur in the cells of highly colored variegated plants, and physiologically they are not very different from the changes occurring in Calathea, Caladium, Codiæum, etc. The approach of maturity in the leaf, and the coming on of cool weather in autumn, stimulates the production of oxidizing ferments, and the action of these and the acids of the cell-sap upon the chromogen, or color contents of the leaves, especially the chlorophyll and anthocyanin, causes many of the brilliant colors of autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while frosts, if they are light, hasten the solution and destruction of the chlorophyll, they cannot be looked upon as more than hastening changes which would occur in time without them. Even in the tropics, some foliage before it matures becomes highly colored, and on the Japanese maples the writer has observed beautiful autumnal colorations in July in the region of Washington.

In practically all deciduous trees, bushes, etc., before the maturing and falling of the leaves, all of the valuable food materials, such as sugars, albuminoids, etc., pass from the leaves through the vascular bundles into the twigs and branches so that they are not lost to the plant. When the leaves finally fall they are therefore nothing but mere skeletons, containing waste materials. In the passage, especially of albuminoid matters, from the leaves to the stems, it is necessary that the materials be protected from the strong action of light, and it is believed that part of the coloration of maturing leaves serves this purpose.

A coloring material, or chromogen, known as anthocyanin, is always present in such cases, and develops beautiful reds when the cell-sap is acid, blue when no acids are present, and violet when there is only slight acidity. This, in connection with the disorganizing chlorophyll, causes the various mixtures of yellow, brown, violet, red, orange, etc., of autumnal coloration as described above. In very young leaves of many plants, such as *Ailanthus glandulosa*, *Juglans regia*, Vitis, Cissus, and many other plants, this same anthocyanin is developed as a protection to the albuminoid materials traveling to the young cells. Such protective colorations have to be distinctly separated from variegations. In evergreen leaves, during the winter, the chlorophyll granules are protected by the development of anthocyanin, forming a brownish or reddish tinge in the cell-sap. This is especially prominent in many conifers.

While, as stated above, these protective and in some cases transitory colorations should be clearly distinguished from variegation, it is an interesting fact that they develop when the conditions for active nutrition are unfavorable, and may in many cases be produced in maturing leaves by starving the plants or permitting them to become sufficiently dry to check growth.

Chlorosis.—This term is usually applied to those cases of the production of yellow or white foliage caused by a lack of some nutrient salt, such as iron, potash, lime, phosphoric acid, etc. The most common cause of chlorosis, or yellowing, is due to the lack of iron. In such cases, the disease is readily cured by either spraying the foliage with a dilute solution of iron sulfate or other iron salt, or watering the roots with the same. Even within a few hours the chromoplasts will begin to turn green, and the plant goes on making starch and sugar from the carbon dioxid of the air in the normal manner. A lack of phosphoric acid sometimes causes a similar trouble, which is cured by the addition of this nutrient substance to the soil. Numerous cases are on record of yellowing of foliage due to excess of soluble lime in the soil. Grapes are especially sensitive to an excessive amount of lime, and turn yellow readily as a result of its action. Soils which contain too much magnesia in proportion to lime also often cause a yellowing of foliage of plants growing in them. All causes of this kind can be readily distinguished from variegation by the fact that all the young leaves produced under such conditions become yellowish or white and are not mottled or marked as in variegated plants. Moreover, the condition is readily corrected by furnishing the proper nutrition, and usually all plants growing in such soils show the same trouble. ALBERT F. WOODS.

VARNISH TREE. *Kœlreuteria paniculata*, *Ailanthus glandulosa*, *Rhus vernicifera*, and other plants.

VASES. Such vases as are shown in Fig. 2642 are common features of formal gardening. All matters concerning their manufacture or beauty are clearly outside the province of this work, but every gardener who purchases such a vase is interested in certain practical horticultural features of its construction. It is imperative that the vase have a hole at the bottom for drainage, otherwise the soil will become sour. It is desirable that the rim of a vase be rounded, as a sharp edge cuts the vines that trail over it and are swayed by the passing wind. Many of the old-fashioned stone vases 4 or 5 ft. high were made with a bowl too shallow for the good of the plants.

2642. Stone flower vase 4 or 5 feet high, used in formal gardening.

Vases are generally stationed in conspicuous positions near buildings, where they receive daily attention from all, including the gardener. It is necessary to water them every morning during hot weather, and it is therefore desirable to have the water supply near at hand. A watering cart is often used in taking care of vases. Vases are often placed in the sunniest situations, but they can also be used in partially shaded spots. On the north side of a building in a shady place sheltered from the high winds small palms may be used in vases, together with Rex begonias and *Pandanus Veitchii*.

The plants used in vases should be of a firm texture, and resistant to drought, dust and occasional high winds. Cannas, ferns and foliage plants that are likely to be cut or whipped by the winds are necessarily excluded. The first thought should be given to a centerpiece. This should usually be some plant of a rather stiff, formal or architectural nature. *Cordyline indivisa* and *C. australis* are excellent for the purpose. They should stand well above the other plants. Around the edges vines are used, especially periwinkles, green and variegated, nasturtiums and *Senecio mikanioides*. Another choice plant for this purpose is *Helichrysum* *petiolatum*, known to gardeners as *Gnaphalium lanatum*. This is an "everlasting" plant which is not truly a vine; it does not flower in vases but is valued for its silvery foliage and pendulous habit. Between the center piece and the rim of drooping vines are used such standard plants of medium height as geraniums, dusty millers, petunias and the common bedding material, as *Lobelia Erinus*, coleus, achyranthes and acalypha. *Centaurea Cineraria* and *C. gymnocarpa* are also useful plants for vases.

The soil in a vase may vary from 6 to 18 inches in depth. It should be a strong, solid compost, about 3 parts of loam to one of manure. If the bowl seems too shallow and becomes filled with roots add a top-dressing of well-rotted manure, or of moss with a little bone meal added. Such a mulch will add plant-food and conserve moisture.

Considerable forethought and taste may be required to keep the vases attractive during early spring, in the interval after the last frost and time when the tender bedding material is set out. Pansies have been suggested for this period, and make a good effect when seen from above. A better effect can be produced by using conifers in pots which have been wintered in a frame. These may be bordered with pansies if the gardener thinks best and can find the time at this season.

Rustic vases are much less expensive than stone, iron or earthenware ones and in some situations are very suitable. It is an excellent idea to elevate a rustic vase on a cheaply constructed pedestal of tree trunk or boards, which will soon be hidden by *Ampelopsis Veitchii*. ROBERT SHORE.

VAUX, CALVERT (1824–1895), an American landscape gardener. Together with Frederick Law Olmsted he planned Central Park, New York, the prototype of large, accessible, nature-like city parks. The following account of his life-work is taken with slight changes from an obituary notice by Wm. A. Stiles in Garden and Forest 8:480: Calvert Vaux was born in London in 1824. He had achieved success in architecture before the age of twenty-four, when he came to America as business associate of Andrew Jackson Downing. At the time of Downing's untimely death in 1854 the two men were designing and constructing the grounds about the capitol and Smithsonian Institution, the most important work of the kind that had yet been attempted in America. Meanwhile, the gathering sentiment in favor of spacious and accessible city parks which had found expression in the eloquent letters of Downing at last secured, through legislative action, the purchase for a public pleasure-ground of the rectangular piece of ground now known as Central Park, New York. In 1858 the city authorities selected, out of thirty-three designs offered in competition for the new park, the one signed "Greensward," which was the joint work of Frederick Law Olmsted and Calvert Vaux, and Central Park as we know it to-day is the realization of this design in its essential features. This was the earliest example in this country of a public park conceived and treated as a consistent work of landscape art, and the first attempt in any country to plan a spacious pleasure-ground which should have the charm of simple natural scenery while it met the requirements of complete inclosure by a compactly built city. No one can read the original plan as presented for competition without feeling how thoroughly an experience of nearly half a century has justified the forethought of the young artists, or without a sense of gratitude to them that our first great park, which has to such an extent furnished a stimulus and a standard to other American cities for similar undertakings, was a work of such simplicity, dignity, refinement and strength. It may be added that this "Greensward" plan, together with other reports on Central Park, on Morningside and Riverside Parks, in New York, on parks in Brooklyn, Albany, Chicago, San Francisco and other cities, both in this country and the Dominion of Canada, by the same authors, contain a consistent body of doctrine relating to public pleasure-grounds which is unique and invaluable. Calvert Vaux was a member of many important commissions, and he acted as landscape gardener for the Niagara Falls Reservation, but for more than thirty years his best work and thought were steadily given to the parks of New York city. He had the genuine creative faculty which gave the stamp of originality to all his work, and a severity of taste which preserved it from anything like eccentricity or extravagance. As a city official he was a model of intelligent zeal and sturdy integrity. Several times he resigned his lucrative position rather than see his art degraded, but he was always quickly reinstated by a demand of the people. To Calvert Vaux, more than to any other one man, New York owes a debt of gratitude for the fact that Central Park, in spite of attacks on every side, has been held so secure against harmful invasion and has been developed so strictly on the lines of its original conception.

In private life Calvert Vaux was a man of singular modesty, gentleness and sincerity. He lacked the graces of manner and magnetism of social intercourse which carry many men in various walks of life to a brilliant position that much exceeds their real merits. Nevertheless, he had many accomplishments and culture of the best type. It is a sad and singular coincidence that both Downing and Vaux met their death by accidental drowning. The career of Calvert Vaux is an inspiring one for all struggling young artists and for all public-spirited citizens in America who are laboring in the work of civic and village improvement. Amid the changing policies of municipal governments, the life-work of Calvert Vaux is a shining example. W. M.

VEGETABLE FIRE-CRACKER. See *Brevoortia Ida-Maia*. **V. Hair.** See *Tillandsia usneoides*. **V. Horse-hair.** Fiber of *Chamærops humilis*. **V. Ivory.** Nuts of *Phytelephas*.

VEGETABLE GARDENING. In horticultural usage a vegetable is an edible herbaceous plant or part thereof that is commonly used for culinary purposes. The product may or may not be directly associated, in its development, with the flower. This definition does not clearly include all the products which ordinarily are considered to be vegetables. Some vegetables, as melons, are properly dessert articles. Only usage can delimit the term. What are considered to be vegetables in one country may be regarded as fruits in another country. However, the use of the term is so well understood that there is no difficulty in making proper application of it in common speech.

All the art and science that has to do with the growing of these plants is popularly known as vegetable-gardening. Recently a Latin-made term, olericulture, has been invented to designate the industry, the word being coördinate with pomology and floriculture. It is not likely, however, that this term will ever come into general use, although it may be useful in formal writings. Vegetable-gardening is ordinarily considered to be a branch of horticulture rather than of agriculture. However, a number of crops may be either horticultural or agricultural subjects, depending on the extent to which they are grown. When grown in establishments that are devoted primarily to a horticultural business, squashes, pumpkins, potatoes and tomatoes are usually regarded as horticultural commodities; but when they are grown on farms where mixed husbandry is practiced and are made a part of the general farm system in rotation, with equal propriety they may be called agricultural crops. There are certain vegetable-gardening crops that are practically always associated with a horticultural rather than an agricultural business. They are such as demand intensive culture and are used for special markets. Of such are lettuce, parsley, cauliflower and radish. Some of the crops may be classified as horticultural or agricultural, depending upon the uses for which they are to be employed. For instance, beans that are grown for the green pods are horticultural subjects, but if the same varieties were to be grown for the mature seed for selling in the general market, they would be known as agricultural products. In like manner turnips may be horticultural subjects when grown in small areas for home use, but agricultural subjects when grown on large areas for stock-feeding.

There seems to be a growing tendency in this country for vegetable-gardening to become a part of general farming schemes. A generation ago a large part of the vegetable-gardening for profit was conducted in relatively small areas by men who devoted their entire time to the business. At present much of the vegetable-gardening enterprise is merely an adjunct to farming proper. This is in part due to the development of the canning industry, because of which enormous quantities of certain products, as of tomatoes, are desired. It is partly due also to the extension of agriculture into the newer regions whereby lands are discovered that are particularly well adapted to the growing of special commodities; as, for example, the raising of squashes in some of the prairie states and the recent extension of melon-growing into Colorado. Long-distance transportation has revolutionized vegetable-gardening in this country. See *Packing*. Whilst there has been great progress in the industry, our vegetable-gardening has not developed so widely from the European ideals as our pomology has. Yet tomatoes, sweet corn, watermelons and sweet potatoes are probably grown more extensively here than elsewhere in the world.

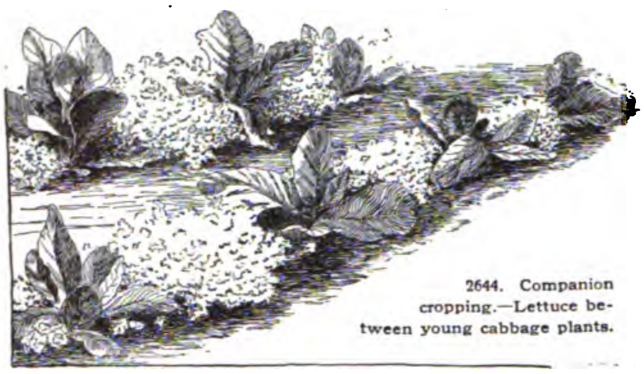
2643. Onion-growing on flat lands in southern New York, the houses being the homes of the workmen.

Vegetable-gardening is an important business wherever there are large cities, because the markets are close at hand. The second most important factor in determining the location is climate, since earliness of product usually increases the profits. A third influence in the geography of vegetable-gardening is the soil. Usually soils of a light and loose character, or those that are said to be "quick," are preferred, because the plants may be started early in the spring and they also grow and mature rapidly. Because such soils are so frequently employed for vegetable-gardening purposes, gardeners have come to be very free users of stable manure and concentrated fertilizers. In recent years the vegetable-gardening areas of the eastern country have rapidly extended along the Atlantic seaboard as far as the keys of Florida. In these southern localities vegetables can be secured in advance of the northern season and when the best prices are reigning. The development of transportation facilities has made this enterprise possible. The southern Mississippi valley region is also developing a large vegetable-gardening interest since it is tapped by trunk lines of railroad running to the north and east. Well-marked vegetable-gardening areas are those on Long Island, N. Y., and about Norfolk, Va., where special industries and practices have developed. Fig. 2643 shows an onion-growing community in southeastern New York.

The most recent published statistics of vegetable-gardening in the United States are those of the Eleventh Census, 1890. According to a bulletin issued by that census the investment in commercial or purely truck-gardening interests of the country lying beyond the immediate vicinity of large cities amounted to more than $100,000,000. More than half a million acres of land were devoted to the industry and nearly a quarter of a million of people were employed. After paying freights and commission, the products of these establishments brought to their owners more than $76,000,000.

Vegetable-gardening may be divided into two great categories, depending on the disposition that is to be made of the products ; namely, market-gardening or truck-gardening, of which the purpose is to make money from the industry; and home- or amateur-gardening, in which the purpose is to raise a supply for the family use. Whilst the same principles of selection of soil, tillage and fertilizing apply to both these categories, these kinds of gardening are unlike in the general methods of procedure. The market-garden is ordinarily located where the climate and soil influences are favorable. Every effort is made to secure uniformity and great productiveness of crop, and it is usually desirable that the crop come into the market somewhat quickly and then give place to other crops. In the home-garden the climate and the soil are largely beyond the choice of the gardener, since these matters are determined by the location of the homestead. The general effort is to secure products of high quality and to have a more or less continuous supply throughout the season. In market-gardening emphasis is usually placed on a few crops, whereas in home-gardening it is placed on a great variety of crops.

The old-time home vegetable-garden was generally unsuited to the easy handling of the soil and to the efficient growing of the plants. Ordinarily it was a small confined area in which horse tools could not be used. The rows were short and close together, so that finger work was necessary. The custom of growing crops in small raised beds arose, probably because such beds are earlier in the spring than those that are level with the ground (Fig. 1528). With the evolution of modern tillage tools, however, it is now advised that even in the home-garden finger-work be dispensed with as much as possible. Some of the very earliest crops may be grown in raised beds to advantage, but in general it is better to secure earliness by means of glass covers or by ameliorating the entire soil by underdrainage and the incorporation of humus and by judicious tillage. See *Tillage* and *Tools*. For farm purposes particularly it is desirable that the rows be long and far enough apart to allow of tillage with horse tools. If the vegetable-garden were placed between the farm buildings and the outlying parts of the farm, the cultivator could be run between the rows when going and coming. In this way nearly all finger-work could be avoided and a greater quantity and better quality of vegetables could be secured. Compare Figs. 1528, 2645.



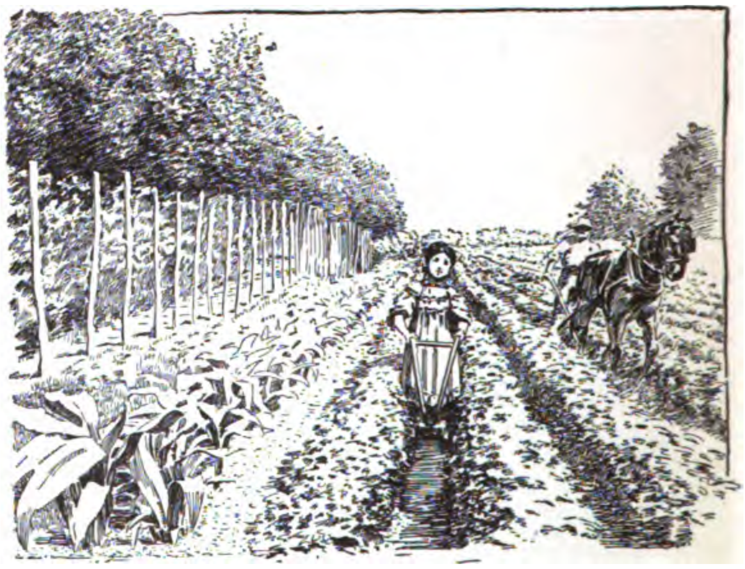
2644. Companion cropping.—Lettuce between young cabbage plants.

Vegetable-gardeners are usually large users of stable manure. Near the large cities the manure is bought in car-load lots, and it is used every year. The reason for this is the necessity of improving the physical texture of the land so that it will be loose, open and mellow, be early or "quick," and hold an abundant supply of moisture. In intensive vegetable-gardening there is no "resting" of the land and no green crops to be plowed under. The vegetable matter, therefore, has to be supplied almost entirely by barn manures. In the larger and less intensive vegetable-growing farther removed from large cities, general agricultural practices can be employed to better advantage, such as rotation and green-manuring. Vegetable-gardeners generally use largely, also, of concentrated fertilizers. These materials may be employed for either or both of two purposes: to start off the plants quickly in the spring, or to add plant-food for the sustenance of the plants during the entire growing season. Ordinarily the former use is the more important in vegetable-gardening, since it is necessary that the plants start quickly in order that early crops may be secured. Many times fertilizer is used in amounts far in excess of the needs of the plant in mere plant-food, in order to give the plants a strong and vigorous start and thereby enable them to make the most of themselves. If the plants are not well established when hot and dry weather comes there is likely to be little profit in them.

In intensive vegetable-gardening it is important to start many of the crops under glass and to transplant the young plants to the open as soon as settled weather comes. This is particularly true of tomatoes, very early lettuce, sweet potatoes, egg plants, peppers and the early crops of celery, cabbage and cauliflower. In the northern states muskmelons and sometimes watermelons and cucumbers are started under glass, being grown in pots, boxes or upon inverted sods, whereby they are more readily transferred to the open. Formerly the plants were started under hotbed or coldframe structures, but of late years there has been a great increase in the extent of glass houses or forcing-houses. In these structures conditions can be controlled better than in hotbeds, and they are permanent investments. However, hotbeds and coldframes are still exceedingly important adjuncts to the vegetable-garden, chiefly because they are not permanent and thereby can be moved when the person shifts to other land, and because the space that they occupy can be utilized for outdoor crops later in the season. Much vegetable-gardening in large cities is prosecuted on rented lands; therefore it may not be profitable to invest in such permanent structures as forcing-houses. The first cost of hotbeds is also less than that of forcing-houses, and this is often a very important item. Fig. 2646. For management of glass structures, see *Hotbeds*, *Greenhouse*, *Forcing*.

There are great numbers of insect and fungous pests that attack the vegetable-garden crops. General remarks under *Insects*, *Fungus*, *Insecticides*, *Fungicide* and *Spraying* will apply to these difficulties. The spray pump has now come to be a necessary adjunct to any efficient vegetable-garden. However, there are many difficulties that are beyond the reach of the spray, particularly those that persist year by year in the soil or which attack the roots rather than the tops. For such difficulties, the best treatment is to give rotation so far as possible and to avoid carrying diseased vines back on the land the next year in the manure. Even the club-root of cabbage can be starved out in a few years if cabbages or related plants are not grown on the area. Any treatment that conduces to the general vigor and well-being of the plant also tends to overcome the injuries by insects and fungi.

In its best development vegetable-gardening is essentially an intensive cultivation of the land. Often it is conducted on property that is too high-priced for ordinary farming. Land that demands a rent on one thousand dollars an acre is often used for vegetable-gardens with profit. There is also intense competition near the large cities. These circumstances force the gardener to utilize his land to the utmost. Therefore, he must keep the land under crop every day in the year when it is possible for plants to live or grow. This results in various systems of double-cropping and companion-cropping, whereby two or more crops are grown on the land the same season or even at the same time. Market-gardening is usually a business that demands enterprise, close attention to details and much physical labor.



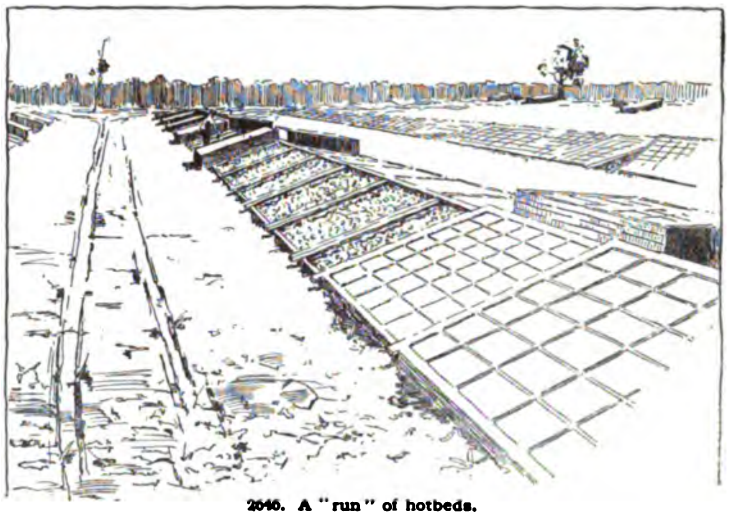
2645. A better way of growing vegetables,—in long straight rows.

If, with his knowledge of vegetable-growing, the gardener combines good business and executive ability, and an intimate knowledge of market conditions, he should be able, however, to make it a profitable and attractive business. Although the outlay is likely to be large, the returns are direct and quick. Fig. 2644.

There is a large literature devoted to vegetable-gardening, although the greater part of it applies chiefly to amateur or home-growing. Leading current books on the general subject of vegetable-gardening are those by Greiner, Green, Henderson, Rawson and Landreth. For California one should consult Wickson's "California Vegetables in Garden and Field," and for the Atlantic south, Rolf's "Vegetable-Growing in the South for Northern Markets." There are many books devoted to special topics, and there are many others which in their time were of great practical value, but which are now chiefly known as recording the history of the epoch in which they were written. Only one American work has been devoted to descriptions of varieties of vegetables, as the works of Downing, Thomas, and others have to varieties of fruits. This work is Fearing Burr's "Field and Garden Vegetables of America," Boston, 1863, and the abridgment of it in 1866, called "Garden Vegetables and How to Cultivate Them." A full list of the American vegetable-gardening literature may be found in Bailey's "Principles of Vegetable-Gardening" (1901). Persons who desire a cyclopedic account of vegetables should consult Vilmorin's "Les Plantes Potagères," the first edition of which is published in London as "The Vegetable Garden." L. H. B.

Vegetable-Growing in California. It is an interesting fact that though California's horticultural prominence now rests upon fruit products, the first attraction to the new state, after the gold discovery, was the wonderful growth of garden vegetables. The reports of immense size, of acreage product and of prices secured, were almost incredible because so much in advance of ordinary standards, but the statements were so fully authenticated that many were drawn to California by them. These horticultural pioneers, however, soon found that immigrants from Asia and the Mediterranean region could, by their cheap living and by doing their own work, cut under American growers who had to employ high-priced labor, and so the latter retired from the field, leaving the opportunity to the frugal and thrifty foreigner. Thus vegetable-growing, from an American point of view, came into disrepute and largely retains such disadvantage at present. The result is that the American largely avoids market-gardening, while Asiatics and South Europeans are thriving on it. There has been a reflection of the same disfavor upon farm growing of vegetables for home use, and our farming population, including the fruit-growers who should know and do better, is largely dependent upon alien vegetable peddlers or products of canneries instead of fresh home-grown esculents, which would be cheaper and inexpressibly better than canned or transported supplies.

Fortunately there are indications that this state of affairs is changing. The uprising during the last decade of a large industry in growing vegetables for overland shipment and for canning seems to have clothed the plant-cultures involved in this trade with new dignity and importance which is attractive to American growers. Cabbage, cauliflower and celery for eastern shipment, peas and asparagus for canning and for shipment, tomatoes for canning, etc., have all become large special crops, while some other plants, like Lima beans, which are chiefly grown in gardens elsewhere, have become field crops in California covering very large acreage. Such enterprises attract American citizens and are changing the popular conception of the dignity and opportunity of vegetable-growing. A measure of this influence, as well as of the extent of the product, may be had in the statistics of the year 1900. In that year there were shipped out of the state by rail and sea 51,400 tons of green vegetables. The product of canned vegetables in 1899 was: tomatoes, 583,061 cases; peas, 25,966 cases; asparagus, 105,881 cases; beans and other vegetables, 38,523 cases. Nearly all the vegetables included in the above trade are of the higher classes, potatoes and onions only moving in considerable quantities when exceptionally high prices prevail in the East. In addition to the foregoing there is the bean shipment to eastern markets, which reached a total of 73,150,000 pounds in 1895, but has been less each year since then because of partial drought in the chief bean districts.



2646. A "run" of hotbeds.

California conditions affecting vegetable-growing are wide and various. Nowhere else perhaps is it more essential that certain things should be done just at the right time and in the right way. If these requirements are fairly met the product is large and fine; if they are neglected the failure is sharp and complete. This fact has given rise to the impression that California is a hard place to grow vegetables, which is not true unless one lacks local knowledge or the nerve to apply it. One of the chief causes of failure is in following seasons and methods which have yielded success under conditions prevailing in the states east of the Sierra Nevada mountains. If one begins garden-making in the springtime the plants do not secure deep rooting, which is necessary to carry them to success in the dry season, and the garden is likely to be a disappointment. If, on the other hand, all the hardier vegetables are sown in succession from September until February or March there will be continuous produce through the winter and into the early summer. The chief shipments of vegetables from California are made during the late fall and winter and are taken right from the ground to the cars without protection or storage. Tender vegetables, like corn, beans, tomatoes, etc., can, however, be grown in the winter only in a few frostless places. They must either be pushed to a finish in the fall or sown early in the spring and carried into the dry summer as far as necessary either by natural moist land or by irrigation. There are, however, a few localities where tomatoes will fruit early in the spring from fall plantings, and peppers will live through the winter and bear a second season's crop on the old plants.

The possession of an irrigation supply is the secret of full satisfaction in California vegetable-growing, but a small amount of water, if skilfully applied, will work wonders. Irrigation will enable one to have something crisp and delicious in the garden every day in the year in the California valleys. It is true, however, that much can be done without irrigation by beginning at the opening of the rainy season in September, growing the hardier vegetables while moisture is ample even on the drier lands during the late fall and winter, and keeping the lower lands well plowed and cultivated to prevent evaporation until the tender vegetables can be trusted in the open air, and continuing cultivation assiduously afterwards so that moisture can be retained as long as possible for them. That this is thoroughly practicable is seen in the fact that the large Lima bean product is grown almost entirely without irrigation from plantings made as late as May and the whole growth of the plant is achieved without a drop of water except that stored in the soil. The same is true of the corn crop: perfect corn can be grown without a drop of rain or irrigation from planting to husking. In such cases, however, the winter rains are retained in the soil by cultivation. If winter growth is made by rainfall, summer growth can be had on the same land by irrigation. In this way irrigation becomes eminently desirable in securing all-the-year growth, which cannot be had by rainfall. With good soil and abundant irrigation it is possible to secure four crops in rotation during the year—the hardy plants in the fall and winter months; the tender plants in the spring and summer. Of course the adjustment of all these means to desired ends requires good perception and prompt action, and explains why those who have been accustomed to plant at a fixed date and do little but cut weeds afterwards may find it hard to get the best results in California. And yet the Californian grower has great advantages in his deep, rich soil, in freedom from diseases which thrive in a humid atmosphere and in an exceedingly long growing season.

Local adaptations for different vegetables are sometimes quite sharply drawn and selection of lands for large specialty crops must be made with reference to them. The result is that the earliest vegetables come from a practically frostless valley near Los Angeles; almost all the Lima beans are grown on a coast plain in Ventura and Santa Barbara counties; the celery for eastern shipment is nearly all grown on the peat lands of Orange county; the cabbage comes largely from San Mateo county; asparagus and tomatoes from Alameda county and river islands of Sacramento and San Joaquin counties, etc. Smaller areas of these products and others not mentioned are more widely scattered, but everywhere the local soil, exposure and climate are chief considerations.

There is prospect of great increase in all the vegetable products of California. Fresh and dried vegetables enter largely into ocean traffic with distant Pacific ports. Interstate trade is constantly increasing and canned vegetables are contracted in advance to European distributors as well as to dealers in all the Americas.

E. J. WICKSON.

VEGETABLE MARROW. See page 1713.

VEGETABLE ORANGE is *Cucumis Melo*, var. *Chito*. **V. Oyster.** See *Salsify*. **Vegetable Pomegranate** is *Cucumis Melo*, var. *flexuosus*. **Vegetable Sponge.** See *Luffa*.

VÈITCHIA (James Veitch, of Chelsea, famous English nurseryman). *Palmàceæ*. About 4 species of pinnate palms native to the Fiji Islands and New Hebrides. The genus belongs to that portion of the Areca tribe characterized by a parietal ovule which is more or less pendulous and fls. spirally disposed in the branches of the spadix, and is distinguished from Hedyscepe and allied genera by the following characters: sepals of the male fls. chartaceous, connate at base: female fls. much larger than the males. It is doubtful whether any species is now in cultivation. *V. Joannis*, H. Wendl., was cult. in the early eighties. The leaf segments have a wide and rather shallow notch at the apex or are obliquely truncate. The sheath petiole and rachis are a dark blood color and covered when young with a gray tomentum interspersed with lanceolate, thin, dark red scales. Fr. 2⅜ x 1¼ in., ovoid-ellipsoid, orange, with a red base. G.C. II. 20:205. R.H. 1883, p. 344. It has been conjectured that *Kentia Van Houttei* advertised in 1895 by American dealers may be a species of Veitchia. The genus is imperfectly known, and nothing further can be said at present of *Kentia Van Houttei*.

VELTHÈIMIA (after the Count of Veltheim, 1741–1801, Hanoverian promoter of botany). *Liliàceæ*. Three species of tender autumn-blooming bulbs from South Africa with dense clusters of pendulous, tubular flowers 1½ in. long, resembling those of the Poker Plant (Kniphofia), though not in color. The plants grow about 1½ ft. high and bloom toward the end of October. Two species are offered by Dutch bulb-growers. They are not showy but are of easy culture. They are practically unknown in America. Generic characters: perianth withering and persistent; tube long, cylindrical; segments 6, very short, ovate; stamens inserted at the middle of the tube; anthers dehisce introrsely: ovules 2, collateral, placed near the middle of the locules: capsule large, membranous, top-shaped, acutely 3-cornered, loculicidally 3-valved. These plants have a large tunicated bulb 2–3 in. thick. The genus is monographed in Flora Capensis, vol. 6. For culture, see *Bulbs*.

A. *Lvs. green, 2–3 in. broad.*

viridifòlia, Jacq. Lvs. oblong-lorate, wavy-margined, finally 1 ft. long: scape mottled with purple: raceme very dense, 3–6 in. long, 25–30-fld.: fls. 1¼–1½ in. long, yellow or reddish, with greenish tips. L.B.C. 13:1245. B.M. 501 (*Aletris Capensis*).

AA. *Lvs. glaucous, 1½ in. broad.*

glaùca, Jacq. Lvs. oblanceolate-lorate, acute, glaucous: scape less stout: fls. "yellow or bright red," according to Baker. B.M. 1091 (fls. white, dotted red toward the tips); 3456 (fls. reddish purple, dotted yellow above).

W. M.

VELVET BEAN. *Mucuna pruriens*, var. *utilis*. See also Bull. 104, Ala. Exp. Sta., by J. F. Duggar.

VELVET PLANT. *Gynura aurantiaca*.

VENETIAN or VENICE SUMACH. *Rhus Cotinus*.

VENÍDIUM (name not explained by its author). *Compósitæ*. The plant listed in one of the largest American catalogues of flower seeds as *V. calendulaceum* is so little known in America that the following account of it as a garden plant is adapted from Gn. 21, p. 405. It is a graceful single-flowered composite which flourishes under the ordinary treatment accorded half-hardy annuals, making a compact, rounded mass 2 ft. high and 3 ft. wide, and "covered for several months consecutively with black-eyed golden blossoms, resembling those of the pot marigold, though much brighter and more refined." "There is considerable diversity in its seedlings both as regards habit and the size, shape and shading of its blossoms, and careful selection in seed-saving is needful in order to secure the best forms. It is admirably adapted for cutting, as the flowers open and shut as regularly as when on the plant." This species has also been treated as a greenhouse perennial, continuing to bloom until near midwinter. The flower-heads are fully 2 in. across.

Venidium is a genus of 18 species of South African herbs, 7 of which are annual, the others perennial. Generic characters: rays female: receptacle honeycombed, mostly nude: involucral scales in several rows, the outer narrower and herbaceous, inner scarious: akenes glabrous, dorsally 3–5-winged or ridged, the lateral ridges inflexed, the medial straight, narrower: no hairs from the base of the akene: pappus either none or of 4 very minute, unilateral scales. Monographed in Flora Capensis, vol. 3 (1864–65).

decúrrens, Less. Diffuse, canescent perennial, 1–2 ft. long: lvs. mostly lyrate, the terminal lobe ovate or roundish, sinuate-lobed or repand, at first cobwebbed, afterwards nude and punctate above, white-tomentose beneath; petiole 2–2½ in. long, amply eared at base, the ear decurrent along the stem.

Var. **calendulàceum**, Harvey (*V. calenduldceum*, Less.), differs in having the petioles not eared at the base or with only a small ear. R.H. 1857, p. 123. Gn. 21, p. 405.—Opinions differ as to its merits. Some consider it coarse and weedy W. M.

VENTILATION. See *Greenhouse Management*, p. 694.

VENUS' FLY-TRAP. *Dionæa muscipula.*

VENUS' HAIR. *Adiantum Capillus-Veneris.*

VENUS' LOOKING-GLASS. *Specularia Speculum.*

VENUS' or VENICE SUMACH. *Rhus Cotinus.*

VÈPRIS. See *Toddalia.*

VERÀTRUM (ancient name of Hellebore). *Liliàceæ.* False Hellebore. A genus of about 10 species of tall, perennial herbs from the temperate regions of the northern hemisphere with short, thick, poisonous root-stocks and rather stout simple stems bearing many broad, plicate leaves and terminated by a long, branched or simple panicle of numerous black-purple, white or greenish flowers. Perianth-segments 6, persistent, spreading; stamens 6, attached at the base of the segments: capsule ovoid, 3-lobed, 3-loculed: seeds flat, broadly winged.

Veratrums are striking foliage plants, of easy culture in moist shady positions. In the open sunlight or in dry ground the foliage is liable to burn and decay prematurely. They may be propagated by division or seeds.

2647. False Hellebore—Veratrum viride

Showing the handsome foliage of early spring when the leaves are about a foot high.

A. *Fls. whitish or greenish.*

B. *Perianth-segments crisped dentate.*

álbum, Linn. European White Hellebore. A hardy perennial 3–4 ft. high: root short, fleshy: lvs. green, plicate; radical lvs. 1 ft. long, oblong, 5–6 in. wide, firm in texture: panicle 1–2 ft. long, dense: fls. whitish inside, greenish outside; segments oblong-spatulate, crisped-dentate; pedicels almost none. June, July. Eu., N. Asia.

BB. *Perianth-segments serrulate or entire.*

viride, Linn. American White Hellebore. Indian Poke. Fig. 2647. A hardy perennial, 2–7 ft. high: rootstock 2–3 in. long: lvs. plicate, acute, the lower oval, about 1 ft. long, the upper gradually smaller: fls. yellowish green; segments oblong or oblanceolate, ciliate, serrulate; pedicels 1–3 lines long. July. North America. B.B. 1:408. B.M. 1096 (*Helonias viride*).

Califórnicum, Durand. Stem very stout, 3–7 ft. high: lvs. ovate-acute, the upper ones lanceolate but rarely acuminate: perianth-segments broader than in *V. viride*, obtuse, whitish with a greener base. Colo. and Wyo. to N. Calif. and Ore.—Int. 1883 by Pringle and Horsford. The long panicle of whitish, bell-shaped, drooping fls. is followed by ornamental fruits or capsules.

AA. *Fls. blackish purple.*

nigrum, Linn. A hardy perennial often 2–4 ft. high, somewhat bulbous at the base: lower lvs. oblong plicate, 1 ft. long, 6–8 in. wide, narrowed at the base; upper leaves lanceolate: panicle narrow: fls. blackish purple; segments oblong, obtuse. June. Eu., Asia. B.M. 963.

J. B. Keller and F. W. Barclay.

VERBÁSCUM (old Latin name of the Mullein used by Pliny). *Scrophulariàceæ.* Mullein. A genus of over a hundred species, mostly coarse, woolly, weedy yellow-fld. biennials native to the Mediterranean region. Considering the fact that the familiar Mullein (*V. Thapsus*) is everywhere known and despised in America, the popularity of the genus in English wild gardens is highly surprising. Over 30 kinds are cultivated, and some of them have been pictured many times. A little study of the group shows how much pleasure can be missed by any one who persists in one point of view. The English farmer has no dread of the Mullein. The Mullein is actually a favorite border plant in England, especially for the back row and for shrubberies. One connoisseur after growing many kinds of Verbascums discarded them all except the common species. The plant probably came to America from England, certainly from Europe, but not long ago it was sold in England under the name of "American Velvet Plant." The "Soldierly Mullein" has often been praised by American writers for its sturdy habit and resistance to the wintry winds; and even a Mullein has its poetic moment, for the young rosette of leaves in the early morning is undeniably beautiful.

There are a few true perennials and some subshrubs among the Verbascums, but the species mentioned below (except No. 17) are believed to be biennials. Yellow is the dominant color, with pale yellow and white variations. The origin of the other colors is explained under No. 12 below. Mulleins usually self-sow freely. Their large symmetrical rosettes are very satisfactory the first year, especially in the case of the silvery-leaved species. The second year they send up stalks 2–10 ft. high and give scattering bloom over a long season, in some cases June to Nov., being at their best in August. The best species are *V. phœniceum* (see No. 12), *V. Olympicum* (No. 17) and *V. phlomoides* (No. 3), the last two deserving special notice.

The Olympian Mullein is the showiest of all Verbascums because of its short season of bloom. It is peculiar in the fact that three and sometimes four years are necessary to bring it into bloom. Meanwhile it makes noble tufts of silvery foliage, the lvs. often attaining 3 ft. in length. The species is the best of the candelabrum type, by reason of its great height (6–10 ft.) and the symmetrical branching of the spike. The fls. are produced in multitudes for three weeks and they are smaller than in *V. phlomoides*. The plant has the disadvantage of being sensitive to wetness, its soft, woolly lvs. damping off in wet situations over winter.

V. phlomoides, though less popular than the preceding, is probably the best of all the yellow-fld. species. It has the advantage over *V. Olympicum* of being a true biennial of easier culture with larger fls. and a longer season of bloom, 8–10 weeks, and even then if cut half way down it will throw out lateral bloom in late autumn.

2648. Verbascum Thapsus, the common mullein.

Generic description: biennial herbs, rarely perennial or suffruticose, more or less woolly: racemes or spikes terminal, simple or branched: pedicels clustered or solitary: calyx 5-cut or 5-parted; corolla with almost no tube, rotate, rarely concave, with 5 broad lobes; stamens 5, affixed at base of corolla; style entire: ovules numerous: capsule globose ovoid or oblong. DC. Prod., vol. 10. Boissier Flora Orientalis, vol. 4. Garden 27, p. 172; 41, p. 551. American trade names are: *V. Chaixii, nigrum, Olympicum, pannosum, phlomoides, phœniceum.*

INDEX.

album, 13.
Blattaria, 9.
blattarioides, 8.
Boerhaavii, 11.
canescens, 1.
Chaixii, 19.
collinum, 1.
crassifolium, 5.
cupreum, 12.
densiflorum, 6.
ferrugineum, 12, 16.
Freynianum, 19.
glabrum, 8.
Lamotei, 1.
Linnæi, 1.
longifolium, 4.
Lychnitis, 18.
macrurum, 2.
nigrum, 13.
niveum, 10.
Olympicum, 17.
orientale, 19.
ovalifolium, 7.
longifolium, 4.
pallidum, 1.
pannosum, 4.
phlomoides, 3.
phœniceum, 12.
pyramidatum, 15.
rubiginosum, 16.
Schraderi, 1.
semi-lanatum, 19.
sinuatum, 14.
thapsiforme, 2.
Thapso-floccosum, 1.
Thapso-nigrum, 1.
thapsoides, 1.
Thapsus, 1.
vernale, 13, 19.
virgatum, 8.
viscidulum, 8.

A. *Anthers of the longer stamens adnate-decurrent.* SECTION I. THAPSUS.
  B. *Fls. clustered.* (*Group 1. Euthapsus.*)
    C. *Anthers short-decurrent: corolla concave at the throat.* 1. **Thapsus**
    CC. *Anthers longer adnate-decurrent: corolla flattened out.*
      D. *The fls. scarcely pediceled.*
        E. *Stem-lvs. long-decurrent.* 2. **thapsiforme**
        EE. *Stem-lvs. short-decurrent.* 3. **phlomoides**
      DD. *The fls. spicate, pedicels sometimes as long as or longer than the calyx.*
        E. *Lvs. very long* .... 4. **longifolium**
        EE. *Lvs. moderately long.*
          F. *Filaments glabrous*... 5. **crassifolium**
          FF. *Filaments white-woolly*............... 6. **densiflorum**
  BB. *Fls. solitary or nearly so.*
    C. *Plants woolly.* (*Group 2. Spectabiles.*) .... 7. **ovalifolium**
    CC. *Plants glabrous.* (*Group 3. Blattaria.*)
      D. *Pedicels in 2's or 3's*...... 8. **virgatum**
      DD. *Pedicels solitary*.......... 9. **Blattaria**
AA. *Anthers all kidney-shaped and of about equal size.* SECTION II. LYCHNITIS.
  B. *Racemes simple, or slightly branched.*
    C. *Calyx rather large.*
      D. *Teeth of calyx ovate*......10. **niveum**
      DD. *Teeth of calyx linear-lanceolate* ....11. **Boerhaavii**
    CC. *Calyx small.*
      D. *Fls. purple* ....12. **phœniceum**
      DD. *Fls. yellow* ....13. **nigrum**
  BB. *Racemes branched or panicled.*
    C. *Clusters of fls. finally remote*.14. **sinuatum**
    CC. *Clusters of fls. near together.*
      D. *Pedicels rarely as long as calyx*....................15. **pyramidatum**
      DD. *Pedicels as long as calyx or longer.*
        E. *Plant green and nearly glabrous*...............16. **rubiginosum**
        EE. *Plants more or less woolly.*
          F. *Filaments white-woolly.*
            G. *Tomentum fleecy: lvs. tomentose on both sides* ....17. **Olympicum**
            GG. *Tomentum mealy: lvs. greenish above*.18. **Lychnitis**
          FF. *Filaments purple-woolly*...............19. **Chaixii**

1. **Thápsus**, Linn. COMMON MULLEIN. Fig. 2648. Familiar weed in woods and in uncultivated fields, 2–6 ft. high, densely woolly, with large oblong root-lvs. and long racemes of yellow flowers. Eu., Orient, Himalayas. B.B. 3:143. Gn. 28, p. 148.—Natural varieties have been observed with pale yellow and white fls. and hybrids with *V. sinuatum, Lychnitis, nigrum*, etc. Other variations are: inflorescence dense or lax, simple or branched: fls. large or small: wool dense or loose: filaments glabrous or pilose. The following European trade names are said to be referable to this species: *V. canescens, Linnæi, pallidum, Schraderi*, and *thapsoides*, all nearly synonymous; *V. collinum, Lamottei, Thapso-floccosum* and var. *Gordoni, Thapso-nigrum.*

2. **thapsifórme**, Schrad. European species with yellowish tomentum and narrowly decurrent stem-lvs. Var. **macrùrum**, Benth. (*V. macrùrum*, Ten.), has white tomentum and more widely decurrent leaves.

3. **phlomoides**, Linn. A clasping-lvd. species valued for its long season of bloom. It has clustered fls. with pedicels shorter than calyx. Naturalized in Mass. Gn. 40, p. 561; 41, p. 555.

4. **longifòlium**, Ten. (*V. pannòsum*, Vis. & Panc.). Italian species known by its very long root-lvs., long interrupted racemes which are somewhat branched, the lower clusters of fls. spicate.

5. **crassifòlium**, Hoffm. & Link. Spanish plant, with long-decurrent lvs., spicate raceme, clustered lvs., flattened corolla and glabrous filaments.—One of the few species that thrives in a light, sandy soil.

6. **densiflòrum**, Bertol. Italian mountain species known by its decidedly yellow wool and long dense racemes.

7. **ovalifòlium**, Sims. Showy Caucasian species with fls. 1½ in. across. Distinguished by its oval, white-woolly lvs. and solitary, sessile flowers. B.M. 1037. B.R. 7:558 (as *V. formosum*).

8. **virgàtum**, With. (*V. blattarioìdes*, Lam.). This and the next are two of the very few Verbascums that are green throughout. *V. glàbrum*, Willd., and *V. viscìdulum*. Pers., represents its glabrous and sticky-pilose variations. Cosmopolitan.

9. **Blattària**, Linn. MOTH MULLEIN. Blattaria is from *blatta*, cockroach, which the plant is said to repel. Plant is frequented by moths, whence popular name. Native of Europe and N. Asia; naturalized in America. One of the few green-leaved Verbascums, distinguished from *V. virgatum* by solitary pedicels. Fls. rarely white.

10. **nìveum**, Ten. Imperfectly known Italian species with white wool, very dense raceme of solitary, subsessile fls. and a 5-parted woolly calyx having ovate lobes.

11. **Boerhaávii**, Linn. Beautiful large-fld. Mediterranean species with copious, snow-white deciduous wool and clusters of sessile flowers.

12. **phœníceum**, Linn. (*V. ferrugineum*, And.). PURPLE MULLEIN. Very distinct and desirable species, being practically the only purple-fld. species in cultivation and parent of nearly all varieties and hybrids having shades of purple, violet, rose, pink and lilac. The white-fld. form is also common. It is a species of southeastern Eu. and Asia. The name *phœniceum* was doubtless suggested by the Phœnicean purple and not by the nativity of the plant. The species grows about 5 ft. high, and is one of the few green species, the lvs. being nearly glabrous or only pubescent. Lvs. ovate: fls. long-stalked, solitary, about 1 in. across, which open poorly in sunshine, preferring damp weather. The species should, therefore, be placed where only the morning and evening sun strike the flowers. L.B.C. 7:637. Gn. 22, p. 377; 27:481: 46, p. 519. A.G. 1892:630.—Var. **cùpreum**, Benth. (*V. cùpreum*, Sims), is a garden hybrid raised from seeds of *V. ovalifolium*, showing influence of *V. phœnicum* in its copper-colored fls. It has long been a favorite. B.M. 1226.

13. **nigrum**, Linn. A common European species, with stem angled above, lvs. nearly glabrous above, long raceme rarely branched and purple woolly filaments. Gn. 27, p. 173; 41, p. 551 (var. *album*, showing the wonderful improvement made by cultivation). *V. vernàle*, Wierz. & Rochel, is referred to this species by Index Kewensis.

14. **sinuàtum**, Linn. Mediterranean species 2–3 ft. high, with sinuate-pinnatifid root-lvs., divaricate, pyramidate panicles and lax, remote, many-fld. clusters.

15. **pyramidàtum**, Bieb. Tall and beautiful species, with doubly crenate lvs. nearly glabrous above, pyramidate, canescent panicle, violet-woolly filaments and a very distinct calyx. Caucasus.

16. **rubiginòsum**, Waldst. & Kit. Stem glabrous or pubescent above: lvs. green, crenate: racemes lax, branched: pedicels 2–3, rarely solitary, twice or many times as long as calyx.—Var. **ferrugineum**, Benth. (*V. ferrugineum*, Mill.), has a long, simple raceme: fls. a little larger and longer than in *V. phœniceum*, and usually in pairs. Either a natural or garden hybrid.

17. **Olýmpicum**, Boiss. Tall Grecian species, 3–5 ft., white-woolly: lvs. tomentose on both sides: panicles with a few very long, erect branches: clusters many-fld.: fls. 1 in. across, filaments white-woolly. The garden merits of this species are discussed above. Gng. 1:273. Gn. 30, p. 213; 31, p. 125; 38, pp. 55, 66; 41, p. 555; 47, p. 147.

18. **Lychnitis**, Linn. Tomentum slight and mealy: lvs. greenish above, crenate: panicles pyramidate, erect-spreading: clusters lax, many-fld.: fls. yellow, rarely white.

19. **Chàixii**, Vill. (*V. orientàle*, Bieb.). Lvs. green or tomentose beneath, crenate, lower ones cuneate at base, truncate or incised: racemes panicled. filaments purple-woolly. *V. vernale* of the trade belongs under *V. nigrum* instead of here, as commonly stated. Gn. 27, p. 172.—Vars. **semi-lanàtum** and **Freyniànum**, Hort., are hybrids. Often attains 10 feet, and acts like a true perennial on warm soils.

W. M.

VERBÈNA (ancient Latin name of the common European vervain, *V. officinalis*). *Verbenàceæ*. Verbenas rank very high among garden "annuals." Their clusters of showy and often fragrant flowers are borne in constant succession from June till frost. They vary from white through lilac and rose to purple and dark purplish blue, with shades of pink and pale yellow. The clusters are about 2 in. across and contain a dozen or more fls. each ⅝–⅞ in. across. The fls. have a tube and 5 spreading lobes, each lobe being notched at the apex.

When special colors or named varieties are desired it is necessary to propagate Verbenas by cuttings. To propagate a particularly choice variety by cuttings, shorten back the plants about September 1, keep them well watered, and by the end of the month there will be plenty of quick, tender growth suitable for cutting. Put the cuttings in the propagating house or even in flats with some soil in bottom and sand on surface. Place the flats in a coldframe, and keep them moist and shaded until the cuttings are rooted. When rooted, transfer to flats in a cool, light house until after New Year's. Then pot them, using 2⅛-inch pots, and allow a temperature of 50° F., which will soon give plenty of material for additional cuttings. Verbenas increased from cuttings tend to flower early, and those propagated in February or March will require at least one pinching. When planting-out in beds for summer bloom, bend the plant over nearly to the horizontal, so that the new growth will spread along the surface of the soil. These shoots will quickly take root, thereby covering the ground. The old method was to peg the plants down.

In propagating general stock, sow the seed in February and pot into 2-inch pots as soon as the seedlings are up an inch. A temperature of 45–50° will answer, but they should have full light. There is no place equal to a mild hotbed for young Verbenas. About April 15 plunge the pots in a few inches of soil in a mild hotbed. Lift them now and then and rub off the roots which go through the bottom of the pot, in order to check growth and hasten flowering. Customers want to see them in flower before buying, and most of them wait till the end of May. However, Verbenas can be planted out early in May, as a slight frost will not injure them.

Verbena is a genus of about 110 species, one Mediterranean, the others American and often weedy. Herbs or subshrubs, decumbent or erect: lvs. opposite, rarely in 3's or alternate: spikes terminal, densely imbricate or long and distant-fld., sometimes corymbose or panicled: corolla-tube straight or incurved; limb somewhat 2-lipped, lobes 5, oblong or broader, obtuse or retuse; stamens 4, didynamous: ovary 4-loculed, 1-ovuled. DC. Prod. 11:535-556 (1847).

WM. SCOTT and W. M.

The following account of Verbenas is extracted from a thesis by J. H. Cowen, whose untimely death deprived American horticulture of a most promising worker. Mr. Cowen was a graduate of the Colorado Agricultural College and had been an assistant in the horticultural department there. After two years' work at Cornell University he received the degree of Master of Arts in June, 1900, and was elected to the fellowship in the College of Agriculture. A few days later he was notified of his election to the chair of horticulture in the state of Washington and also at Colorado. He accepted the position at his alma mater. The day before his intended departure he was stricken by appendicitis. He died July 12, 1900. The work in Colorado was very much to his heart. It was his native state. He knew the people and the conditions. No man was ever better fitted for the work he expected to undertake.

It was Mr. Cowen's intention to recast his thesis in cyclopedic form. The following account has been changed as little as possible. The botanical part at the end is entirely recast, but the readable portion contains Mr. Cowen's own words, with a few slight verbal changes and some omissions.

In 1836 Loudon styled the Verbenas "a genus of weedy plants." The lapse of a few years was sufficient to prove this remark to be inapplicable in many cases, for on the plains and prairies of South America grew a number of species of such surpassing beauty as to set at naught all preconceived notions of the inherent ugliness and "weediness" of the genus.

Introduction of Parent Species, 1826–1838.—The first of this noble race to be introduced was *Verbena chamædryfolia*, a dazzling scarlet. This species has had a profound influence upon the "selfs" of *V. hybrida*, particularly the scarlets, and is one of the predominant parent species of the "compactas."

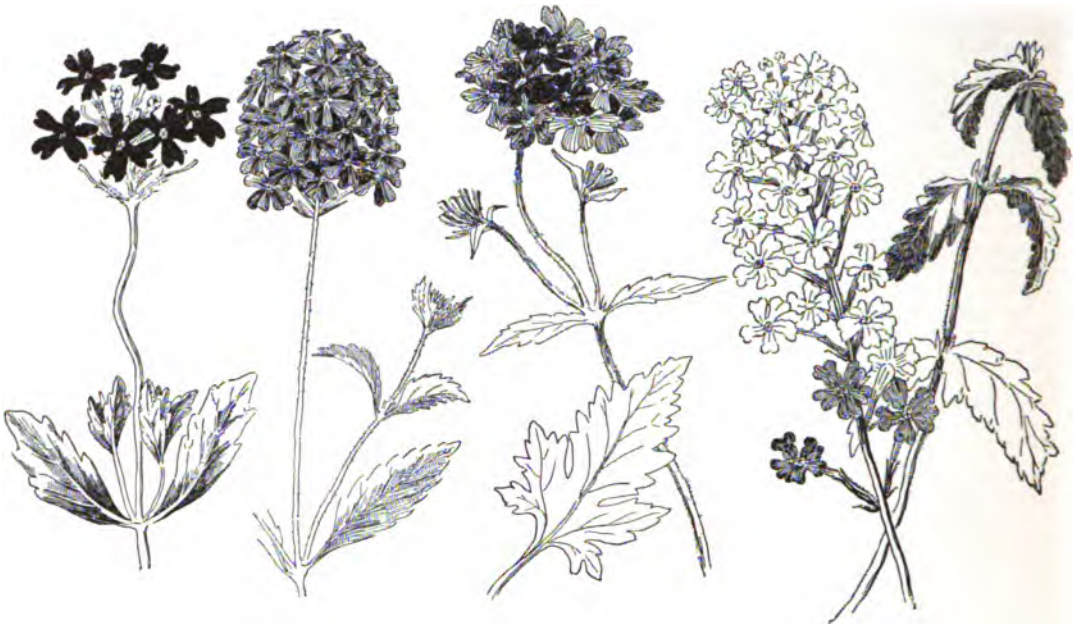
The second important South American species to be introduced was *Verbena phlogiflora*, in 1834. The flowers are inclined to rose or purple rather than to scarlet, and, according to early plates, are more regular; they are elevated on longer peduncles and the cluster is oval or oblong instead of flat or merely convex. This species and *V. chamædryfolia* seem to be the principal parents of the various red, scarlet and rose-colored forms in cultivation.

Verbena incisa flowered in England for the first time in 1836. This species is characterized by rosy or purplish, rather regular flowers, borne in a flat or slightly convex cluster. The corolla is strikingly lighter colored below than above. The leaves are much more deeply cut than in the two preceding species. The habit of growth resembles that of *V. phlogiflora*, but is rather tall and weak, three feet high in cultivation. This species was doubtless used in hybridizing, but its distinctive characters are now practically obliterated in the forms of *V. hybrida*.

Verbena teucrioides is a species of strikingly different characters from the three preceding and one which has exerted a most profound influence upon many races of *V. hybrida*. Five plants flowered in Ireland in July or August, 1838. This species is easily distinguishable by its spikes of white flowers, which emit a rich jessamine fragrance, its recurved, coarsely crenate, sessile leaves, and its stiff upright habit of growth. The characters of *V. teucrioides* are apparent in many forms of our *V. hybrida*, notably so in many of the blue "oculatas." Of the four species thus far mentioned, *V. teucrioides* alone is still cultivated in a distinct specific form.

These four species seem to be the only ones which have had a marked and permanent influence upon our improve it that a great number of horticultural varieties soon appeared and English varietal names gradually superseded the unwieldy quasi-botanical ones. All the species, except *V. teucrioides*, seem to have soon lost their specific identity and to have completely merged in *V. hybrida*. The additions made through the four or five years following 1836 were astonishing, as we find in 1840 upwards of 40 kinds enumerated, while in 1844 a single list contained the names of over 200 varieties.

In 1839 Robert Buist, Sr., of Philadelphia, introduced the leading forms to America. Robert Buist, Jr., states positively that these were obtained from England. It is sometimes erroneously stated that Buist obtained seeds directly from South America. He seems to have been for years the leading Verbena grower and hybridizer in America. It is impossible from the meager American literature, to discern any striking difference between the trend of development in America and in Britain. In his "Directory" of 1845, Buist mentions the fact that some of the better varieties have flowers as "large as a dime, far outvying those cultivated a few years ago." In 1854 he speaks of new varieties of "perfect formation" and "flowers as large as a quarter dollar," and as "good as the titled English varieties." Doubtless the Verbena was developed to a higher degree of perfection as an exhibition flower in Britain than in America.



2649. The four prototypes of the garden Verbenas, faithfully redrawn from early colored plates.

From left to right: *V. chamædryfolia*, chief parent of the reds; *V. phlogiflora* and *incisa*, the originals of the rosy and purple colors; and *V. teucrioides*, a white flower which is chiefly, if not wholly, responsible for the fragrance of the hybrid Verbenas.

present races of Verbena. *V. tenera* and *V. Aubletia* have probably been used occasionally by florists in hybridizing, but they belong to a different section of the genus, some of their hybrids seldom produce seeds and their influence, if any, has been slight and transient.

With the successful introduction of *V. teucrioides* in 1838, Verbena lovers had a most promising start for the development of a splendid group of garden plants. They possessed four species, the great variability of which gave opportunity for limitless selection, and the close affinities of which afforded the most favorable opportunities for profitable hybridizing. *V. chamædryfolia* provided one of the richest scarlets in nature, *V. phlogiflora* and *V. incisa* provided various tints of rose and purple, *V. teucrioides* gave white with a rather elusive suggestion of yellow. *V. chamædryfolia* was of prostrate habit; *V. teucrioides* was stiff and upright; the other two species were intermediate. *V. teucrioides* was possessed of a rich perfume.

Early Period of Hybridizing and Selection, 1838–1848.—Selection and hybridizing had already begun in 1838 and had been rewarded with the production of "several excellent varieties." The first of these were given trinomial Latin names. The Verbena gained popularity so rapidly and so many efforts were made to

Period of Greatest Popularity, 1848–1868.—The Verbena was fast winning favor as one of the most popular of bedding plants. Its history as an exhibition plant began about 1850 and reached its zenith in 1868, when the Verbena was at the greatest height of popularity. It was in this year that the Royal Horticultural Society of England awarded premiums to 17 varieties. Its height of popularity as a bedding plant was reached some years before this, possibly as early as 1860, for there seems to have been a growing opinion unfavorable to it as a bedding plant as early as 1861.

Period of Decline and Partial Recovery, 1868–1900.—About 1870 the Verbena took a precipitous decline in public favor. There were many causes that conspired to its downfall, but chief among these were:

(1) A number of other plants captured the capricious

admiration of flower-lovers. A host of showy-flowered and zonal pelargoniums were offered to the public. Henderson says that in 1870 he sold 20,000 pelargoniums and that in 1875 he sold 100,000. In many bedding arrangements the Verbena was wholly superseded by the pelargonium. The tuberous-rooted begonias and *Phlox Drummondii* likewise contributed to the neglect of the Verbena, the latter of the two largely superseding it as an exhibition plant. In the west of England, however, the Verbena continued to be used to a slight extent as an exhibition plant up to 1889.

(2) About this time (1870) the Verbena was beset with unusually destructive insects and diseases. These troubles were not new, for as early as 1844 it was recognized that there was difficulty in preserving plants over winter on account of the attacks of mildew and of greenfly, but the reward was sufficient compensation for the required vigilance. It is probable that the highly artificial conditions and "coddling" to which the Verbena was subjected during the period it was used so extensively as an exhibition plant, contributed to weaken its constitution and thereby to heighten the destructive influence of the mildew and aphid.

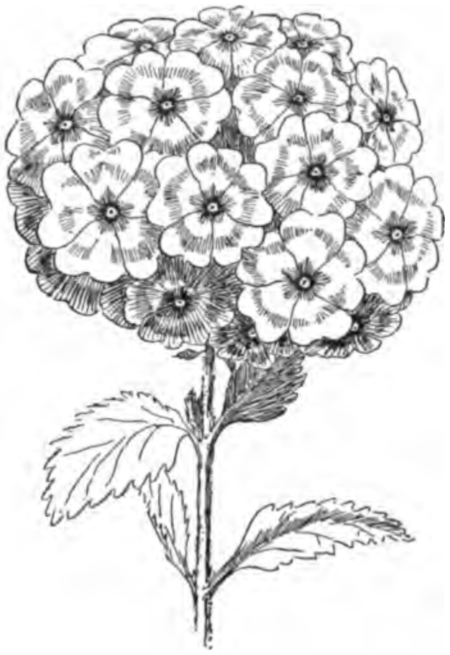
The prospects for the Verbena have somewhat improved within recent years. The German varieties maintained their constitutions better than the English ones, and the American climate seems better suited to the Verbena than the European. Owing to the long recognized difficulty of "wintering over," the treatment of the Verbena as an annual has come into practice and its success is most gratifying. With the improvement of the habit of growth by the evolution of a race of "compactas" and by the fixing of the various colors so that they will come true from seed, the Verbena has gained a new lease on present and future popularity.

The form and size of the individual flower and of the flower-cluster have been closely associated and have had a concomitant evolution. By observing Fig. 2649 it is apparent that in the prototypes of our present garden forms of *Verbena hybrida* the individual flowers are irregular, the upper lobes of the corolla being narrower, large vacant spaces occur between the lobes, and the flowers are relatively small. *V. chamædryfolia* is the most irregular, *V. incisa* and *V. teucrioides* are somewhat less irregular, while *V. phlogiflora* (if the artist was true to his subject) had nearly symmetrical lobes. In none of these species were the corolla-lobes expanded strictly in a plane at right angles to the tube. The flower-cluster of *V. chamædryfolia* was likewise very defective, from the florist's standpoint, in that considerable portions of the space were unoccupied, giving to his eye a ragged, unfinished appearance. *V. incisa* and *phlogiflora* were appreciably better in this respect, while in *V. teucrioides* the flowers were unsatisfactorily scattered along a sparse spike. The Verbena fancier soon established in his mind an ideal of "pip" and "truss," toward which he constantly selected. This conception doubtless changed from decade to decade, but the essential features remained fairly constant. This ideal type is admirably exemplified in Fig. 2650, which is a reproduction of an apparently idealized lithograph of 1872. The individual flowers are over an inch in diameter, the lobes are geometrically symmetrical and fill the space perfectly, but do not crowd. The flower-cluster is of graceful, oblate-oval form, with no unoccupied spaces and yet not overcrowded.

Though the Verbena breeder probably never completely realized the ideal flower and cluster, this ideal has had a most significant influence. The greatest progress in improving the size and form of the individual flower and of the flower-cluster was made during the fifties and sixties, especially during the period in which the Verbena was used as an exhibition plant. This is quite natural, because exhibition plants are seen at close range, and the English gardeners of this period were very formal in their tastes. On the other hand, such a high degree of symmetry is not sought in flowers used for bedding and for borders. They are seen at greater distances. Abundance of bloom and depth of color are of greater importance. It is probable that the best Verbenas of to-day would hardly come up to the standard of those grown by the English gardeners of 1868 if judged by formal symmetry.

The Verbena has little tendency to "sport" toward the production of double flowers. However, such forms occasionally occur among seedlings.

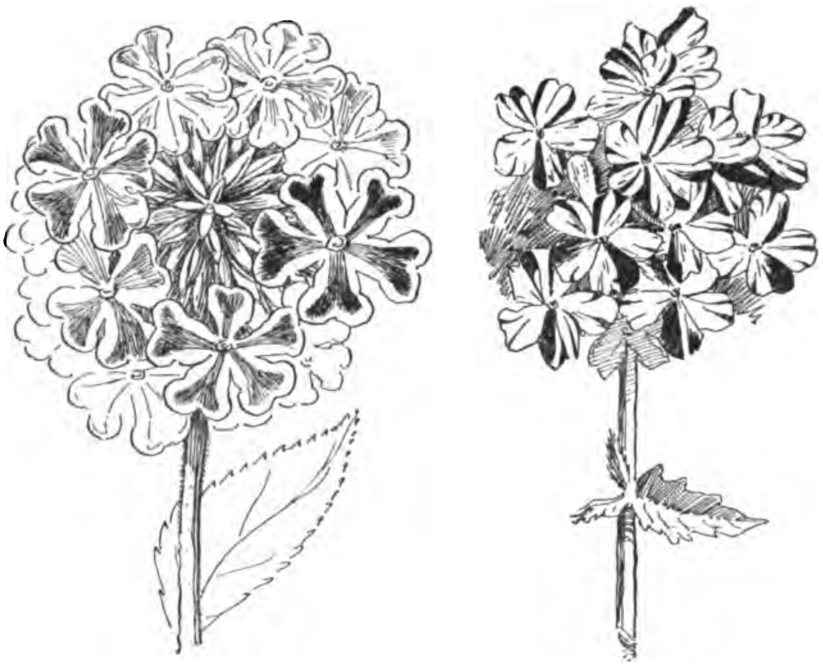
Development of the Eye.—The only "eyed" effect observable in the prototypes of *V. hybrida* was that produced by the palisade of white hairs in the throat and the yellowish color of the inside of the tube. At present we have numerous races of "oculatas" with distinct white or yellowish eyes of various sizes. Two different kinds of color markings are spoken of as "eyes;" viz., dark centers and lemon or white centers. In this discussion the term is applied only to the latter. In a list of 48 select varieties published in 1848 several are described as having dark centers, two have lemon eyes, and two have white or "light" eyes. It seems evident from the plates of this period, however, that these "light" or "white" eyes were very small and would now be unworthy of the name. The "clear yellow eye" of "Lord Leigh" is probably the largest distinct eye produced prior to 1863. Previous to this time many varieties had been admired for their dark centers which were doubtless very pleasing; since 1863 less attention seems to have been given to the dark centers and more to the development of distinct white or lemon-colored eyes. The recognition of a distinct class of oculatas does not seem to antedate 1870, and it is the impression of the undersigned that the French and German Verbena fanciers deserve most of the credit for the recent development of the important oculata class. The ideal oculata of to-day has a clear, distinct, white eye of only medium size. Very large eyes are not so pleasing. They have a tendency to give a "chopped" appearance.



2650. An ideal type of Verbena.
Adapted from an English colored plate of 1872.

Reds.—The first stem parent, *V. chamædryfolia*, had red flowers, and red in its various modifications of crimson, scarlet, rose, etc., has been predominant throughout the entire history of the Verbena. Every accessible list of varieties from 1845 to the present shows a preponderance of reds. Robinson's Defiance, a brilliant crimson, very popular in the fifties, has left so strong an influence as to give the class name "Defiance" to numerous varieties and strains, some of which are doubtless direct derivatives of this historic variety.

Whites, and the Matter of Fragrance.—Of the four prototypes, *V. teucrioides* alone was white, or white with a shade of pink or an imitation of yellow. Among the hybrid Verbenas there have been, from the first, a few prominent white varieties; but there is no period during which the proportion of whites exceeded about one in eight, or one in ten. Whites are more frequently fragrant than other colors. Good reds are seldom or never fragrant, pinks occasionally so, mauves, purples and blues frequently so. A rich jessamine fragrance was one of the noteworthy characters of *V. teucrioides.* Whites in many, perhaps a majority of cases, show foliage and pubescence characters of *V. teucrioides.* This is especially true in plants propagated from seed.



2651. Old style (on the left) and new style of color markings in Verbena.

That at the left was popular at least from 1849 to 1865. The Italian or modern striped race at the right was introduced about 1862, and is the only one known to-day.

Blues and Purples.—It seems that different shades of purple were occasionally represented in the wild forms of *V. incisa* and *phlogiflora;* however, there were no distinctly blue ones, and in the early history of the Verbena there is a dearth of blue varieties. We find in the Florist of 1854, that "Bluebeard" is "really blue" and that "a good blue has long been wanted, most of the so-called blues being of a blue-purple color." Subsequent to the fifties the number of blue varieties recorded in lists appreciably increase, but they by no means equal the reds, being little if at all in excess of the number of whites. Our best blues of to-day (for example Blue Boy) are of a deep, royal purple (per Ridgeway's color plates) rather than really blue. A great variety of tints and shades of purple are represented. In the blue varieties which the writer has grown, especially the ones from European seed, there has been a striking resemblance to *V. teucrioides* in foliage, pubescence, habit of growth, etc. They also resemble this species in having many that are very fragrant.

Yellow.—A good yellow has been the dream of many a Verbena lover, but it is doubtful whether the dream will ever be fully realized. Gartenflora of 1890 reports a *V. hybrida lutea*, but it is not constant and the yellow is dim. Gartenflora of 1896 reports that *V. teucrioides lutea*, Vilm., was produced from *V. teucrioides*, that it is "bright yellow," and that it will be "joyfully received by Verbena lovers."

The Striped Varieties. — Two classes of so-called striped Verbenas have arisen: one sort having the median portion of each lobe of the corolla of a dark color, usually red or rose, and the margin white; the other sort having irregular stripes, dots and dashes of red, rose or purple upon a white ground color. See Fig. 2651. The former class seems to have originated with the British florists somewhat previous to 1849, and was the most popular "striped" class with them for many years after the introduction of the second class of striped ones. The true striped or Italian Verbenas were introduced into France and England from Italy about 1862. Cavagnini Brothers, of Brescia, are given the credit of having originated this unique race. It is the general opinion of writers that the Italians are derivatives in part of *V. tenera*. Surely the foliage of the Italian varieties portrayed in Flora des Serres and of striped varieties now grown shows no "pinnatifid laciniate" foliage of *V. tenera*. Neither has the undersigned been able to find any evidence of the anther appendages of *V. tenera*. However, it is impossible to determine with certainty the parentage of hybrids on structural characters alone. The true explanation may be that the *V. pulchella* which is said to have been used, was not *V. tenera*, Spreng., but some form of *V. hybrida*, Hort. The striped varieties are unstable and have a strong tendency to revert to "selfs," whether propagated by seed or by cuttings. In the writer's own experience, a seedling with blue and white striped corolla reverted in four generations of cuttings, so that some of the plants produced only flowers that were solid blue; others, flowers that were white with only an occasional small mark of blue. Striped Verbenas afford excellent opportunity for the study of bud-variation.

Production of Leaf-Variegation (*yellow foliage*).—Comparatively little attention has been given to leaf-variegation among the Verbenas. However, a number of varieties having leaves variegated with yellow were introduced about 1865, during the period when variegated plants were so popular. At present we have a strain of yellowish leaved Verbenas which come true to this character from seed.

Development of the Compactas.—Early in the history of the Verbenas their "straggling and uncontrollable" habit of growth was lamented. Considerable pegging was necessary in order to keep the plants in any desired position and repeated efforts were made to secure bedding varieties of closer, more upright habit. Considerable progress was made by British florists during the sixties. Most of the progress, however, has been made subsequent to 1870 and the German Verbena growers of Erfurt deserve much of the credit for the production of this splendid little race that has done so much to help restore the Verbena again to popularity. Compactas have been fixed in various colors so that they will come true from seed. In most botanical characters they resemble *V. chamædryfolia* and *phlogiflora.*

Development of Treatment as Annuals. Seed-Fixing. —When the Verbenas were first introduced they were propagated to a considerable extent by separating the prostrate, rooting branches and potting them. This method was soon abandoned in favor of propagation by cuttings. Verbenas root very readily and they were grown from cuttings almost exclusively up to 1880, except that seed propagation was employed for the production of new varieties. During all this period, as a consequence of much fortuitous and intentional hybridizing, and of no effort having been made to fix varieties, seedlings were very variable and untrue to parent varieties. Soon after the decline of the Verbena in 1868–70 seed propagation was more extensively employed. It obviated the very troublesome experience of wintering over stock plants, which were so susceptible to attacks of mildew and aphis. Soon efforts were made to fix strains that would come true to color and habit from seed. This has been most successfully accomplished, and the Verbena is gaining much of its popularity through treatment as an annual. Seeds are sown in March. The plants are hardened off in a coldframe and set out in the latter part of May. They flower profusely from June to October. Striped varieties are not easily fixed.

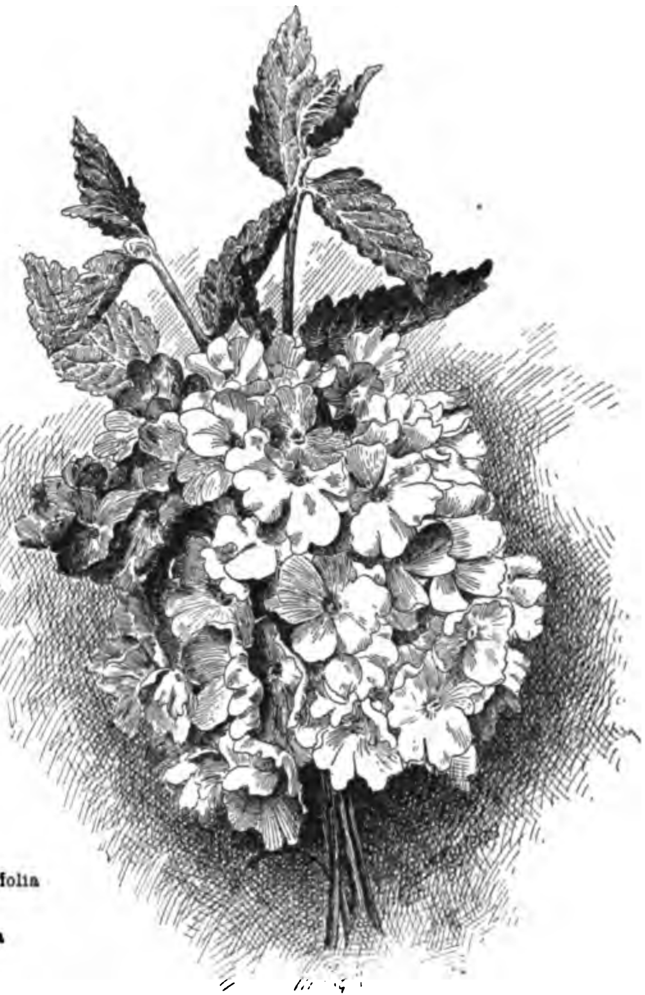
Summary of Present Horticultural Types (*V. hybrida*).—It is impossible to satisfactorily classify the hybrid garden Verbenas according to their botanical derivation. They are conveniently classed according to color of flowers into: (1) Selfs, or one-colored varieties; (2) Oculatas, or eyed varieties; and (3) Italians, or striped varieties. As to habit they may be divided into: (1) Standards, those of the ordinary loose, spreading growth; and (2) Compactas, which are much reduced in stature and of more condensed form. Verbenas now in cult. are shown in Figs. 2652–4.

INDEX.

Aubletia, 9.
bipinnatifida, 8.
Canadensis, 9.
chamædryfolia, 1.
Drummondii, 9.
erinoides, 7
incisa, 3.
Lamberti, 9.
Melindres, 1.
melindroides, 1.
montana, 8,.9.
multifida, 7.
phlogiflora, 2.
pulchella, 6,7, 8.
tenera, 6.
teucrioides, 4.
Tweedieana, 2.
venosa, 5.

A. *Connective of the upper anthers not appendaged.*
  B. *Clusters not panicled. Prototypes of the Garden Verbenas* (*V. hybrida, Hort. Fig. 2652*).
    C. *Fls. scarlet*.................. 1. **chamædryfolia**
    CC. *Fls. rose or purple.*
      D. *Clusters oval to oblong: lvs. saw-toothed*......... 2. **phlogiflora**
      DD. *Clusters flat or convex: lvs. more deeply and sharply cut*...................... 3. **incisa**
    CCC. *Fls. white* .... 4. **teucrioides**
  BB. *Clusters panicled*............. 5. **venosa**
AA. *Connective of the upper anthers furnished with a glandular appendage.*
  B. *Fls. violet or rosy purple.*
    C. *Bracts half as long as calyx: plant a subshrub*.......... 6. **tenera**
    CC. *Bracts about as long as calyx or a little shorter: plant annual* .... 7. **erinoides**
  BB. *Fls. lilac: plants annual.*
    C. *Lvs. twice pinnatifid*........ 8. **bipinnatifida**
    CC. *Lvs. once pinnatifid*......... 9. **Aubletia**

1. **chamædryfòlia**, Juss. (*V. Melindres*, Gill. *V. melindroides*, Cham.). Fig. 2649. Characterized by red fls. in flattish clusters, oblong, coarsely scalloped, nearly sessile lvs. and rather stiff pubescence. Stems slender, forking, creeping at base, hirsute: branches somewhat ascending: lvs. oblong or ovate, base broadly cuneate, contracted into the short petiole, crenate or subincisely serrate, serrations often unequal, strigose above, below hairy, especially on nerves: peduncles elongated, ascending: spikes solitary, capitate: bracts lanceolate-subulate, ciliate: calyx hirsute canescent, sparingly glandular, more than twice as long as the bracts: corolla crimson, limb irregular.—Occurs in two rather distinct forms: var. **Melindres** has oblong to oblong-lanceolate lvs., which are unequally incised-serrate. This form is less hirsute and is more graceful and vigorous. It was the form first introduced to cultivation. Var. **melindroides** has shorter, broader lvs. and is more hairy. Different forms occur over southern Brazil, Uruguay, Paraguay, and the whole of the Pampas. B.R. 14:1184. L.B.C. 16:1514. B.M. 3333. P.M. 1:173. B. 3:129.



2652. The common garden Verbena—V. hybrida (X 1).

2. **phlogiflòra**, Cham. (*V. Tweedieàna*, Niven). Fig. 2649. Characterized by rosy or purple fls. in oblong or oval clusters; resembles No. 1, but has more upright habit, softer pubescence and larger, longer-pointed, distinctly petioled lvs. Stems ascending: branches rather erect, much subdivided, angled, retrorsely hirsute: lvs. oblong or lanceolate-triangular, acute, base entire, cuneately long-attenuate into the evident petiole, unequally subincised serrate, somewhat venosely rugose, strigose above, below hairy or strigillose pubescent: spikes terminal, pedunculate, many-fld., oval to oblong:

bracts short-ovate to subulate-lanceolate: calyx twice as long as bracts, covered with short pubescence interspersed with short capitate glandular hairs. Southern Brazil and Uruguay. B.M. 3541. P.M. 4:5. B. 2:60.

3. **incisa**, Hook. Fig. 2649. Rosy or purple-fld. species with lvs. more deeply cut than in the two preceding. Whole plant hairy-pubescent; stems ascending; branches erect: lvs. oblong-triangular, base cuneately truncate or subcordately attenuate into the evident petiole, pinnatifid-lobed or deeply serrated and incised, upper lvs. sublanceolate, sessile, incisely pinnatifid: spikes terminal, pedunculate, subternate, flat or convex: bracts ovate: calyx 4 times as long as bracts, short-hairy, sprinkled with glandular hairs: corolla-tube glandular-pubescent, thrice as long as calyx; limb large, rose-purple, paler beneath, obovate lobes deeply emarginate. Southern Brazil, Paraguay and northern Argentine Republic. B.M. 3628.

2653. Verbena teucrioides, as cultivated to this day (× ⅙). The spike elongates still further.

4. **teucrioides**, Gill. & Hook. Figs. 2649, 2653. Characterized by fragrant white fls. in very long clusters. Stems cespitose, rooting at base, ascending, terete, openly and copiously hirsute: lvs. ovate to oblong-triangular, base entire, sessile or nearly so, obtusely serrate, margins revolute, veiny-rugose, glandular-pubescent above, subtomentosely hispidulous on veins below: spikes terminal, solitary, glandular, hairy, lax, 5–9 in. long: bracts subulate-lanceolate, ciliate; calyx nerved, twice as long as bracts; corolla yellowish white or pinkish, long exserted, twisting in age, fragrant. Southern Brazil, Uruguay, Argentine Republic, Chile and Peru. P.M. 5:243. B.M. 3694.

2654. Young plant of Verbena venosa, too young to show the characteristic panicled arrangement of clusters (× ⅓).

5. **venòsa**, Gill. & Hook. Fig. 2654. Differs from all other cultivated kinds by panicled inflorescence and tuberous roots. Herbaceous perennial, 1 foot high: stems simple, rhizomatic, creeping at base, ascending, 4-angled, hairy: lvs. rigid, oblong to oblong-lanceolate, the subcuneate base entire and half-clasping, acute at apex, unequally subincisely dentate, the teeth openly acuminate, nerves prominent, hirsute below: spikes in a close terminal panicle, subternate, lateral ones pedunculate, fastigiate and finally cylindrical: bracts subulate, ciliate, often purplish, exceeding the hairy calyx: corolla lilac or bluish purple to nearly sky-blue, very thinly villous without; tube slender, thrice as long as calyx: fr. 1 line long, copiously fuscous outside, dorsal ridges 5. Southern Brazil and Argentine Republic. B.M. 3127.—Tubers may be kept indoors over winter, or species propagated by seeds sown in greenhouse in January.

6. **ténera**, Spreng. (*V. pulchélla*, Sw., not Hort.). Herbaceous perennial: stems cespitose, decumbent, rooting; branches slender, 4-angled, ascending, sparsely hairy: lvs. decurrent into the short petiole, 3-parted and again pinnatifid into acute, linear, entire, subrevolute divisions, sprinkled with short hairs: spikes terminal pedunculate: calyx elongated, strigose pubescent or hairy, sprinkled at angles with short stipitate patellaform glands, twice as long as bracts; corolla rose-violet; anther appendages barely exserted, claviculate, subrecurved. Southern Brazil and LaPlata region.

7. **erinoides**, Lam. (*V. multífida*, Ruiz and Pav. *V. pulchélla*, Hort., in part). Moss Verbena. Annual or perennial: stem strigose hairy or somewhat hirsute, branching, decumbent, rooting: branches ascending: lvs. ovate in outline, cuneate base decurrent into the petiole, deeply 3-parted and the divisions pinnatifid into narrow linear acute lobes, subrevolute on margins, strigose especially on nerves: spikes terminal, solitary, pedunculate, soon elongating and relaxing, canescent hairy: bracts lanceolate, acuminate, spreading, one-half as long to as long or longer than the calyx; corolla rather small, shortly exserted, lilac, bearded within; anther appendages exserted, rather short.—Said by Dr. Gillies to be "one of the commonest plants on the Alps of Clile and Mendoza . . . varying extremely in color of flowers, in stature and in degree in which the leaves are cut." In some individuals the fls. are said to be scarlet, in others blue or purple. Forms assignable to this species occur also in the southern states of Brazil. The species is probably a composite one as now recognized. B.R. 21:1766 (as *V. multífida*, var. *contracta*). Variable but unique species characterized by distinct, finely cut foliage and rosy lilac to deep purple fls., but the clusters and individual fls. are too small to make it popular.

2655. Verbena Aubletia (× ⅓).

8. **bipinnatífida**, Nutt. (*V. pulchélla* of some German seedsmen. *V. montàna*, Hort., in part). Perennial, prostrate and rooting at base; stems stout, upright, branched, 6–18 in. high: lvs. rather thick, petioled, 1–2½ in. long, scabrous above, ovate in outline, bipinnately parted or 3-parted into numerous oblong, rather acute lobes 1–3 lines broad: spikes solitary, dense to rather lax, at first capitate, becoming 2–4 in. long in fr.: corolla 5–8 lines long, purple or lilac, limb 4–5 lines broad, lobes emarginate to obcordate; throat of corolla provided with a palisade of short hairs; upper stamens bearing each a small oval to oblong purplish gland. Texas to Neb. and Col.—Flowers become bluish purple in drying.

9. **Aublètia**, Jacq. (*V. Aublètia*, var. *Drúmmondii*, Lindl. *V. Canadénsis*, Britton. *V. Drúmmondii*, Hort. *V. Lámberti*, Sims. *V. montàna*, Hort., in part). Fig. 2655. Perennial, pubescent, with rather stiff hairs or glabrate: branches slender and ascending from a sometimes creeping rooting base, 6–18 in. high: lvs. ovate or ovate-oblong in outline, 1–3 in. long, truncate, broadly cuneate or subcordate at base and the petiole more or less margined, incisely lobed and toothed, often deeply 3-cleft: spikes peduncled, dense, short and capitate in early flower, becoming 2–4 in. long in fruit: bracts subulate, mostly shorter than the calyx—these and the calyx densely glandular pubescent: calyx-teeth unequal, filiform-subulate; corolla 6–10 lines long, from bluish purple or lilac to rosy purple or white, frequently approaching blue in dried specimens; limb ½-¾ in. broad, lobes oblong or obovate, emarginate and more or less revolute near the sinuses, throat provided with palisade of short white hairs: upper anthers bearing each a light brown, oblong gland which is barely exserted. Colo. and Mex. eastward across the continent. B.B. 3:72. B.M. 308:2200. B.R. 4:294; 23:1925.—Reported as producing many garden and spontaneous hybrids. Garden forms are of stouter habit, less inclined to root at base; lvs. larger, dark shiny green above, more conspicuously veiny, clusters and individual fls. larger, and the color variation more striking. Many forms have a rich spicy fragrance quite different from that of the hybrid Verbenas. On account of the robust, healthy nature of *V. Aubletia* it has been frequently recommended in horticultural literature as desirable for hybridizing with the hybrid Verbenas to improve their constitution. The cross would probably be too radical for best results. It is to be regretted that this charming species which is thought well of in Europe should be neglected in its native America.

V. bracteata and *hastata*, two weedy North American species, have also been offered for cultivation, but they have small garden value. Descriptions are easily obtained.

J. H. Cowen.

VERBENA, LEMON. *Lippia.*

VERBENA, SAND. See *Abronia.*

VERBESÌNA (probably a meaningless alteration of Verbena). *Compósitæ.* Crownbeard. About 50 species of American herbs, annual or perennial (some tropical species shrubby), with alternate or opposite, often decurrent lvs. and corymbose or solitary heads of yellow or white flowers; rays sometimes wanting, pistillate or neutral: akenes flattened or those of the rays 3-sided, their margins winged or not; pappus of 2 (1–3) awns, sometimes with 2 or 3 intermediate scales.

About half a dozen hardy perennial Verbesinas have slight rank as garden plants, but the competition among yellow-fld. autumn-blooming composites is so great that Verbesinas have little chance. The following species is a robust and rather coarse plant, growing 4–8 ft. high, and suitable only for the wild gardens and the back row of the hardy border. It is doubtless of the easiest culture. It blooms from Aug. to Oct., and has numerous yellow fls. ½–1 in. across in flattish clusters.

occidentàlis, Walt. (*V. Siegesbéckia*, Michx.). Hardy perennial herb, 4–8 ft. high: lvs. ovate (uppermost oblong-lanceolate), acuminate, serrate, the larger ones 8 in. long, contrasted into a marginal petiole: rays styliferous and usually fertile: awns of pappus not hooked. Dry hillsides, eastern U. S. B.B. 3:430.

W. M.

VERMONT, HORTICULTURE IN. Fig. 2656. Vermont has no reputation as a horticultural state, either amongst her own citizens or outside her boundaries, yet there is not one important fruit or vegetable crop of the temperate zone, not even excepting apricots and peaches, which cannot be grown to perfection here. With the exception of apricots, peaches and sweet cherries all the temperate fruits can be produced in great perfection. The only reason which can account for the non-development of Vermont's horticultural resources is the fact that the possibilities are not appreciated by her land-owners. Vermont farmers are extremely conservative and slow to make a change in their methods of farming, so that the signal success of the few who have taken up fruit-growing makes but small impression on the many who are still busy making butter and growing hay, potatoes, and little patches of grain.

The home markets for fruit and vegetables are unusually good. Strawberries rarely sell for less than 12½ cents a quart, and the average price for good fruit is probably nearer 15 cents. Blackberries usually bring 10 cents and raspberries 10–12½ cents. Cherries are hardly to be bought, though sour cherries thrive and cherry pie is popular. The price for cherries is always $3 to $4 a bushel. Good vegetables sell equally well. With such favorable markets, supported by numerous small manufacturing villages and a horde of summer boarders, horticultural industries certainly ought to thrive.

The horticultural regions of Vermont are, roughly, three. The first and most important is the Champlain valley district, including several large islands in Lake Champlain. This region reaches off toward Montreal on the north; and the general character of its horticulture is much like that in the St. Lawrence valley between Montreal and Lake Ontario. Winter apples are the most important crop in this section. The second region lies in the southwestern part of the state and belongs to the upper Hudson valley. Apples will grow readily when attended, but they are seldom cared for. Greater success is secured with small fruits, the growing of which is greatly encouraged by the large annual immigration of summer residents. The third district comprises the valley of the Connecticut. It is the least developed of the three, horticulturally. The reason for this fact is not plain. Soil and climate are admirably adapted to all sorts of fruits. Even peaches are successfully grown in orchards. The few men who are growing plums, cherries, strawberries, etc., are proving every year that the Connecticut valley in Vermont is naturally as much a fruit region as any other.

The apple crop offers the single semi-exception to the statement that Vermont has no horticultural reputation at home. There are a few commercial apple orchards in the Champlain valley which grow as fine apples and yield as handsome cash profits as any orchards in America. Grand Isle county, made up of land lying in Lake Champlain, has the principal reputation for apples. The best orchards and the best orchardists are found there; but Addison county ships about double the quantity of apples.

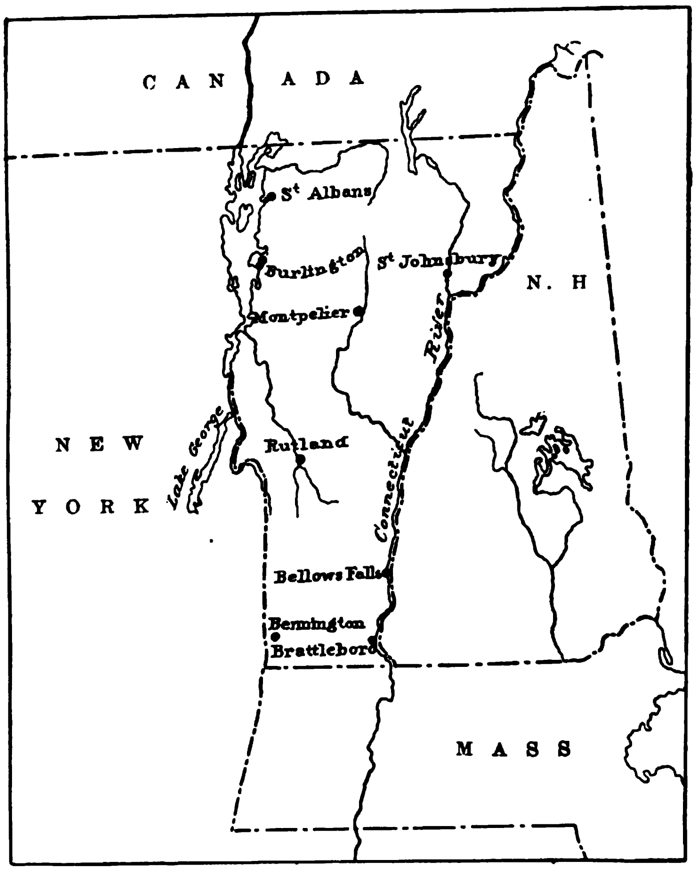
The varieties of apples grown for market are principally Greening, Spy, Baldwin and Fameuse. Next to these come McIntosh, King, Ben Davis, Spitzenburgh, Seek-no-further and Arctic. A few old orchards contain many of the old-time favorites, such as Fall Harvey, Dutch Mignonne, Gilpin, Grimes Golden, and the like. But such collections are few and uncherished. The modern commercial varieties are the only ones in repute.

Vermont has had some experience with the Russian apples. In fact, Dr. T. H. Hoskins, of Newport, on the northern boundary of the state, has been one of the most famous experimenters with the Russian importations. Nevertheless the Russian varieties have made small impression on the pomology of the state.

Plums are grown just enough to prove that they will succeed admirably. Lombard, Green Gage, Bradshaw, the Damsons and other old-fashioned sorts still retain the preference of conservative Vermonters, though other growers are planting chiefly of the Japanese varieties, especially Burbank and Abundance. In the northern and mountain towns only the Americana and Nigra types are hardy enough; but even these are seldom grown.

Among cherries Morello, Montmorency and Richmond are favorites. Raspberries are mostly red, the blackcaps being seldom grown. Cuthbert is the leading variety, though Schaffer and Columbian are gaining friends rapidly. Blackberries are not carefully grown usually. Fine blueberries are picked from the fields in considerable quantities. Early varieties of grapes can be ripened for home use, Concord, Worden, Moore Early, Green Mountain and Delaware being leading varieties.

.IBRARY
of Michigan



2656. Outline of Vermont.

Truck gardening is practiced, of course, in the neighborhood of all the principal cities; but it cannot be said to be a well-managed business. Those crops which grow in special perfection are beans, potatoes, peas, tomatoes, salsify and parsnips. Those which cannot be grown, or which are, as a rule, unsuccessful, are melons, okra, sweet potatoes, turnips and Lima beans. Special crops which are sometimes grown in quantities for export are seed peas, white beans and onions.

On account of the long, cold winters and the short, cloudy days of that season, greenhouses are operated at a great disadvantage. The production of hothouse vegetables is, therefore, very small, and florists find it difficult to grow roses and lilies, or even violets and carnations, at a profit.

The Vermont Horticultural Society was organized December 3, 1896. It is, therefore, a young, though an active and useful society.

F. A. WAUGH.

VERNÒNIA (after Wm. Vernon, an English botanist who traveled in North America). *Compósitæ.* IRONWEED. A genus of nearly 500 species of perennial herbs or rarely shrubs, with alternate, pinnately veined leaves and usually purple or rose flowers borne in the following species in terminal cymes. The genus is widely scattered about the world, but is possibly most plentiful in South America. The following species are native of the United States, and are hardy perennial herbs of attractive appearance, with rather large heads of purple flowers in terminal clusters in late summer or early fall.

Heads not glomerate, several- to many-fld.: involucre of dry or partly herbaceous, much-imbricated bracts: corolla regularly 5-cleft into narrow lobes: akenes mostly 10-costate.
apex and a c
base: pap
American
of easy cu
border, bei
division.

A. *H*

Arkansà
high: lvs.
long, alter
not branch
filiform ti
Mo., Kan.
B. 3:302.

Form 96 10-52 20M S

AA. *Heads 15–40-fld.*

B. *Lvs. narrowly linear.*

C. *Plant about 1 ft. high.*

Lindheimeri, Gray & Engelm. Stem excessively leafy up to the inflorescence: lvs. 1½–3 in. long by 1–2 lines wide, with revolute margins: fls. in a corymbiform cyme. July–Sept. Rocky hills, W. Texas.

CC. *Plant 2–4 ft. high.*

Lóttermani, Engelm. Stem fastigiately and cymosely much branched at the summit: lvs. 2–4 in. long, only 1 line wide, margins not revolute: fl.-heads numerous, ½ in. long, 10–14-fld. July–Sept. Sandy soil, Arkansas.

BB. *Lvs. not narrowly linear.*

C. *Bracts of involucre tipped with slender awns.*

Noveboracénsis, Willd. Fig. 2657. Stem 3–6 ft.: lvs. oblong to oblong-lanceolate, 3–9 in. long: heads in an open cyme: involucre commonly brownish or dark purplish: fls. rarely white, usually in moist soil. July–Sept. B.B. 3:302.—The more common species of the eastern United States.

CC. *Bracts not awned.*

D. *Plant tomentose.*

Báldwini, Torr. Stem 2–5 ft. high: lvs. lanceolate to ovate-lanceolate, 4–8 in. long: bracts greenish acute or acuminate, tips spreading or reflexed. Fls. earlier than most species, in July and August. Prairies, eastern Mo. to Tex. B.B. 3:302.

2657. Isolated specimen clump of Ironweed—Vernonia Noveboracensis.

DD. *Plant glabrous.*

E. *Lvs. thin.*

altíssima, Nutt. Stem 5–10 ft. high: lvs. veiny lanceolate or lanceolate-oblong, 4–12 in. long: bracts obtuse or merely mucronate-tipped, closely appressed. July–Sept. Western Pa. to Ill., La. and Fla. B.B. 3:303.

EE. *Lvs. thickish.*

fasciculàta, Michx. Stem 2–5 ft. high: lvs. somewhat obscurely veined, linear to oblong-lanceolate, 3–6 in. long: heads numerous and crowded on the branches of the cyme: bracts obtuse or some of the upper mucronate-acute, closely appressed. July–Sept. Ohio and Ky. to the Dakotas and south to Texas. B.B. 3:303.

F. W. BARCLAY.

VERÓNICA (after St. Veronica). *Scrophulariàceæ.* SPEEDWELL. The Speedwells are mostly herbs, with a few exotic shrubs, best known by their usually long racemes of small blue flowers. About 200 species, mostly in the northern hemisphere, a few species in the tropics and southern hemisphere. In New Zealand they are a dominant feature of the country. Plants in cultivation are mostly hardy at the North, usually low-growing and occasionally prostrate. Lvs. opposite, rarely verticillate or alternate: fls. in axillary or terminal racemes and bracted; calyx 4–5-parted; corolla usually blue, rarely pink or white, wheel-shaped or salver-shaped, the lateral lobes or the lowermost one commonly narrower than the others; stamens 2, exserted, one on each side of the upper lobe of the corolla; style entire, subcapitate: capsule flattened, obtuse or notched at apex, 2-furrowed: seeds few or many.

All are showy, free-flowering plants, used, except the shrubs, as garden perennials or annuals, and are propagated by seeds, the perennials also by division, the shrubs by cuttings in spring or summer. They succeed in any good garden soil in a sunny situation. The lower-growing forms are good rock-plants; the taller are adapted to the herbaceous border. The shrubby forms are greenhouse plants or grown only in warmer parts of the country, particularly California, where they are everblooming, and where they do well along the coast even in exposed places by the sea. The shrubby species are mostly natives of New Zealand. They are well reviewed in The Garden 45, p. 506, and 28, p. 292. Some of them have enjoyed a considerable popularity in England, where they are generally seen in cool conservatories, but they survive the winters outdoors in the most favored parts of the British Isles. The first hybrid was raised in 1848 by Isaac Anderson-Henry (then Isaac Anderson), a noted hybridizer. This gentleman continued his experiments for several years, using *V. speciosa*, *salicifolia* and *elliptica*. His work was continued by others, and most of the hybrid Veronicas of to-day have the parentage above indicated, with the blood of *V. speciosa* generally much in evidence. If a collective name for Veronica hybrids is desired, *V. speciosa* var. *hybrida* is the best name for the whole group. Unfortunately all these hybrids are unfit for general cultivation out-of-doors in northern climes, but a hardier race will probably be secured by using *V. Traversii* and its allies, which have been introduced more recently. Some of these are *V. Colensoi*, *Rakaiensis*, *anomala*, *monticola* and *pimeloides*,—all unknown to the American trade. A third and still hardier group of the New Zealand Speedwells is the truly alpine group known as Whipcord Veronicas. These should be quite hardy in northern rockeries. They are unknown in America now. The best of the group is said to be *V. cupressoides*, var. *variabilis*, known to English trade as *V. salicomoides.* Others in cultivation are *V. Hectori*, *Armstrongi* and *lycopodioides.*

Veronica was monographed by Bentham in Latin in DC. Prod. 10:458–491 (1846), 158 species being then known. An excellent account of cultivated Veronicas is found in Vilmorin's Blumengärtnerei.

INDEX.

alba, 12, 18.
alpina, 11.
alpestris, 9.
amethystina, 16.
Andersonii, 4.
Austriaca, 25.
Buxbaumii, 7.
candida, 14.
Chamædrys, 23.
circæoides, 19.
crenulata, 17.
decussata, 3.
elegans, 16.
elliptica, 3.
foliis variegatis, 12.
gentianoides, 12.
Hendersoni, 4.
Hulkeana, 1.
imperialis, 4.
incana, 14.
Japonica, 10.
longifolia, 17.
macrocarpa, 6.
montana, 20.
officinalis, 21.
paniculata, 16.
pectinata, 22.
pinnata, 15.
prostrata, 24.
Purple Queen, 4.
repens, 13.
rosea, 17, 18.
salicifolia, 5.
serpyllifolia, 9.
speciosa, 4.
spicata, 18.
spuria, 16.
subsessilis, 17.
Syriaca, 8.
Teucrium, 24.
Traversii, 2.
villosa, 17.
Virginica, 10.

A. *Plants shrubby, all from New Zealand and all with opposite leaves; tender in the North.*
  B. *Margin of lvs. coarsely serrate*.. 1. **Hulkeana**
  BB. *Margin of lvs. entire.*
    C. *Pairs of lvs. crowded.*
      D. *Racemes subterminal*....... 2. **Traversii**
      DD. *Racemes axillary*........... 3. **elliptica**
    CC. *Pairs of lvs. rather distant*.... 4. **speciosa**
      D. *Height 3–6 ft.: lvs. 1–1½ in. wide.*
      DD. *Height 10–15 ft. or more: lvs. 4–8 lines wide.*
        E. *Capsule scarcely twice as long as calyx* .... 5. **salicifolia**
        EE. *Capsule about three times as long as calyx*........ 6. **macrocarpa**
AA. *Plants hardy herbs.*
  B. *Duration annual.*
    C. *Height a foot or less: fls. blue.*
      D. *Racemes axillary*........... 7. **Buxbaumii**
      DD. *Racemes terminal*.......... 8. **Syriaca**
    CC. *Height 2–4 ft.: fls. whitish*.... 9. **serpyllifolia**
  BB. *Duration perennial.*
    C. *Lvs. in whorls of 4–7: corolla salver-shaped, tube longer than limb*...................10. **Virginica**
    CC. *Lvs. usually opposite, occasionally alternate.*
      D. *Racemes terminal.*
        E. *Habit creeping: plants 3–12 in. high.*
          F. *Capsule oblong*.........11. **alpina**
          FF. *Capsule roundish or broader than long.*
            G. *Apex of capsule slightly notched*.....12. **gentianoides**
            GG. *Apex of capsule deeply notched* ....13. **repens**
        EE. *Habit upright: plants stronger growing and taller.*
          F. *Foliage and stem white-woolly* ....14. **incana**
          FF. *Foliage nearly glabrous: lvs. large, dentate.*
            G. *Lower lvs. pinnatisect.*15. **pinnata**
            GG. *Lower lvs. merely serrate or crenate.*
              H. *Racemes panicled*..16. **spuria**
              HH. *Racemes solitary or few.*
                I. *Lvs. lanceolate* ...17. **longifolia**
                II. *Lvs. ovate-oblong*..18. **spicata**
      DD. *Racemes axillary.*
        E. *Habit low and creeping.*
          F. *Lvs. narrow*............19. **circæoides**
          FF. *Lvs. broader.*
            G. *The racemes few-fld*...20. **montana**
            GG. *The racemes many-fld.*
              H. *Fls. pale blue, rarely pink*.......21. **officinalis**
              HH. *Fls. deep blue, white center*............22. **pectinata**
        EE. *Habit taller, more upright.*
          F. *Calyx 4-parted*..........23. **Chamædrys**
          FF. *Calyx 5-parted.*
            G. *Lvs. more or less dentate*.................24. **Teucrium**
            GG. *Lvs. deeply pinnatifid.*25. **Austriaca**

1. **Hulkeàna,** F. Mueller. Showy lilac-fld. species, readily distinguished by its serrate lvs. and terminal racemes. Slender, erect, sparingly leafy, straggling shrub, 1–3 ft. high, with branching stems: lvs. 1–1½ in. long, in sparse pairs, ovate or oblong, obtuse or acute, coarsely serrate, smooth, leathery: raceme slender, terminal, branching, spreading, 4–10 in. long: fls. sessile, lilac: capsule small, longer than broad, twice exceeding the sepals. Summer. Mts. and rocky places, New Zealand. B.M. 5484.

2. **Tráversii,** Hook. f. White-flowered shrub about 2–3 ft., of special interest as being hardy in Ireland and parts of England. A smooth, much-branched shrub: lvs. linear or linear-oblong, entire, smooth, opposite, sessile, thick, ¾–1 in. long, numerous: racemes axillary, large: fls. many, small, white or mauve: capsule acute, 3–4 times exceeding the calyx. All summer. New Zealand. B.M. 6390. Gn. 32, p. 217.

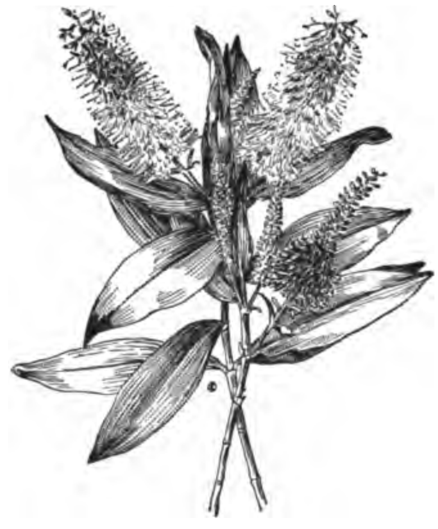
3. **elliptica**, Forst. (*V. decussàta*, Soland.). Remarkable for its white fls., which are large for the genus, ½–¾ in. across. Small or tree-like: lvs. oval or oblong-elliptic: racemes axillary, few-fld.: fls. white or flesh-colored. New Zealand and antarctic regions. B.M. 242. J.H. III. 35:225.—Not advertised in America now.

4. **speciòsa**, R. Cunn. A half-hardy bushy branching shrub, 3–6 ft. high. Stout and very smooth, the branches angled: lvs. obovate-oblong, subsessile, thick and smooth, 2–3 in. long: racemes axillary, densely fld.: fls. blue to violet, with rose, red or white varieties: capsule exceeding calyx. Banks of streams, New Zealand. B.M. 4057. R.H. 1844:60. **Andersonii**, Lindl. & Paxt. (*V. Héndersonii*, Hort.), a hybrid of *V. salicifolia* and *speciosa*, is a summer bedding plant and also a greenhouse subject. It grows 18 in. high: lvs. oblong, sessile, entire, thickish: racemes axillary: fls. bluish violet. F.S. 5:658. Fig. 2658.

Var. **imperiàlis**, Boncharlat (*V. imperiàlis*, Hort.), has large, dense spikes of "amaranth-red" or crimson-purple flowers. F.S. 22:2317. The excellent "Veronica Purple Queen" is alleged to be a hybrid of *V. Traversii* and *V. Hendersonii* and to have violet-blue fls. with a white center. The handsome plate Gn. 45:966 shows no trace of *V. Traversii* nor of white center. The plant is close to *V. speciosa*. In some catalogues *V. Hendersonii* and *V. subsessilis* are said to be synonymous, but this is a gross error.

5. **salicifòlia**, Forst. Strong, half-hardy, glabrous shrub with flattened branchlets, approaching a tree in size and habit: lvs. lanceolate, subsessile, entire, smooth, 2–3 in. long, pointed: racemes axillary, densely fld.: fls. bluish to white, large, pedicelled: capsules large, longer than broad, pointed, exceeding the sepals. New Zealand, where it is a graceful tree 10–15 ft. high. Gn. 26, p. 107; 28, p. 293; 34, p. 349.

6. **macrocárpa**, Vahl. Young branches glabrous: lvs. sessile, lanceolate, entire, acute, smooth: racemes densely fld.: fls. bluish to white: capsule ovate-oblong, thrice exceeding the calyx. With habit and lvs. of *V. salicifolia*. Mts., New Zealand.



2658. Veronica Andersonii (× ⅓). No. 4.

7. **Búxbaumii**, Tenore. Prostrate annual, with elongated slender pubescent stems, the lower branching and often rooting: lvs. ovate, subcordate, coarsely crenate-serrate, pubescent, shortly petioled, ¾ in. long, the lower opposite, the upper alternate and similar: racemes axillary: fls. small, blue, scattering, on long pedicels, of long duration: capsule broader than long, very widely notched, exceeded by the sepals. April–Sept. Fields, middle and S. Europe, Asia and naturalized in N. Amer. F. 1846, p. 112.

8. **Syriaca**, Roem. & Schult. Ascending, diffusely branched pubescent herb, 6–12 in. high: lvs. ovate or ovate-lanceolate, incised or dentate, smooth; lower petiolate, upper subsessile, ½ in. long: raceme terminal, slender, 4–6 in. long: fls. blue, with thread-like pedicels ½ in. long: capsule broader than long, notched two-thirds of its length, exceeding the sepals. June. S. W. Asia. R.H. 1897, p. 311.

9. **serpyllifòlia**, Linn. (*V. alpéstris*, Hort.). Thyme-leaved Speedwell. St. Paul's Speedwell. Slender, ascending, nearly smooth plant, growing irregularly in clumps 2–4 ft. high, the base prostrate and rooting: lvs. ovate or oblong, crenate, ¼–½ in. long, smooth, variable: racemes loose, with conspicuous bracts; fls. pediceled, whitish or pale blue with deeper stripes: capsule wider than long, obtusely notched, exceeding or equal to the sepals. May–July. Roadsides and fields, Asia, Eu., N. Afr., N. and S. Amer.

10. **Virgínica**, Linn. (*Leptándra Virgínica*, Nutt.). Great Virginian Speedwell. Culver's Root. Erect, simple, somewhat pubescent herb 2–6 ft. tall: lvs. in whorls of 4–6, lanceolate, 2–4 in. long, smooth above, pubescent below, acutely serrate, short-petioled: racemes terminal, erect, long, dense: fls. many, white or pale blue, short-pediceled: capsules longer than broad, pointed, twice exceeding the calyx. Aug.–Sept. Eastern states.—Free-growing herb. Likes rich soil and much sun. While stiff and coarse, it is bold and stately. Var. **Japónica**. Of similar character but a month earlier. Japan.

11. **alpina**, Linn. A slender, delicate plant growing from a creeping stock, branching at the base, becoming ascending or upright, the flower-stems often solitary, 2–6 in. high: lvs. opposite, occasionally alternate, subsessile, elliptic or oblong, entire or dentate, about ½–1 in. long, of varying size, the lowest small, orbicular: raceme short, spiciform, dense: fls. small, blue or violet: capsule ¼ in. long, oblong, longer than broad, hairy, exceeding the calyx. Mts. of Eu., middle and N. Asia and alpine and arctic regions in America. B.M. 2975.—Adapted to the rock-garden. Blackens when dried.

12. **gentianoides**, Vahl. Gentian-leaved Speedwell. Erect, slender, tufted species 6–24 in. high, according to soil and position, from creeping roots and leafy stems below broadening above into a spicate raceme: lvs. obovate or oblong, some lanceolate or linear, thickish entire or small crenate, smooth, 1½–3 in. long; root-lvs. more or less in rosettes; upper lvs. bract-like, smaller and narrower: raceme elongated, leafy, many-fld., hairy: fls. pale blue, with darker streaks on long pedicels: capsule nearly round, slightly notched, exceeding the calyx. Wet alpine fields, S. E. Eu. B.M. 1002.—A hardy species in any soil or location, shade-enduring though not necessarily shade-loving, blooming early. Prop. by division. Forms a mat and makes a good ground cover for bare spots in midsummer. Also a valuable border plant. One of the earliest. Var. **fòliis variegàtis** is a dwarf form with variegated lvs. used in formal bedding. Another variety has longer flower-stems and larger fls. which are light lavender. Var. **álba** has white flowers.

13. **rèpens**, DC. Creeping Speedwell. Prostrate, slender, compact plant growing in dense masses: lvs. ¼–½ in. long, ovate, slightly crenate, shining green and moss-like: racemes slender, few-fld.: fls. nearly white, with a trace of blue: capsules broader than long, deeply notched, exceeding the sepals. May. Forests of Corsica. Hardy in Mass.—Grows in the sun. Will cover the ground where grass does not grow, forming a sod in a short time. Prefers moist corners but thrives on a moderately dry soil.

14. **incàna**, Linn. (*V. cándida*, Hort.). Hoary Speedwell. Strong, upright or ascending, white-woolly plant 12–18 in. high, with many sterile matted branches and fewer fertile erect branches: lvs. opposite, acute, lower oblong, upper lanceolate, 1–3 in. long, white-tomentose: racemes erect, numerous, 3–6 in. long: fls. many, blue, short-pediceled: capsule longer than broad, thick, exceeding the woolly calyx. July–Sept. Fields and mountain regions. N. Asia, and southwestern Eu.—Resembles *V. spicata* in habit. Has a good

appearance both in and out of bloom. Useful in the rockery, border or geometrical garden.

15. **pinnàta**, Linn. Strong, upright plant 2–3 ft. high, glabrous or pubescent: lvs. sparse or somewhat clustered, finely cut, the lower pinnate with spreading segments, the upper pinnatifid, thickish, shining, smooth: racemes slender, many-fld., elongated: fls. blue. June, July. Open mountain lands, Russia.

16. **spùria**, Linn. (*V. paniculàta*, Linn. *V. amethýstina*, Willd.). Bastard Speedwell. Upright, slender, densely pubescent species 2 ft. high: lvs. mostly opposite or ternate, 1 in. long, linear, acute, serrate-crenate toward the apex, entire below, smooth, narrowed at the base, thickish: racemes numerous, panicled, long, densely many-fld.: fls. blue, pediceled: capsule nearly round, thick, exceeding the sepals. May, June. Woods, southeastern Eu. and southern Russian Asia.—Becomes weedy late in the season. Var. **élegans**, Voss. Lvs. pubescent on both sides: habit much branched and more slender than the type. A form with variegated lvs. and flesh-colored fls. is known to the trade as *V. elegans carnea variegata*.

17. **longifòlia**, Linn. Strong, leafy, upright, densely growing species 2½ ft. high, with usually a smooth stem: lvs. lanceolate or oblong-acuminate, sharply serrate, lower opposite, upper more or less verticillate, pubescent below, very acute, 2½–4 in. long: racemes long, erect, spiciform, dense: fls. lilac, numerous: capsules longer than broad, notched, a little exceeding the linear sepals or sometimes exceeded by them. Becomes black in drying. July–Sept. Wet fields, middle and eastern Eu. and northern Asia.—Much cultivated and hybridized. Has several varieties. A fine border plant and the most common species, growing and flowering freely in any good soil. Var. **subséssilis**, Miq. Fig. 2659. More erect, compact and robust than the type, 2–3 ft. high, growing in clumps with numerous side branches and of a good habit: lvs. 2–4 in. long, according to the richness of the soil: spikes longer and fls. larger than of the type and of an intense lustrous blue. Aug.–Oct. Japan. B.M. 6407. R.H. 1881:270. G.C. II. 16:788. A good border plant and considered the best Speedwell. Best in deep, rich soil in an open position.

Var. **ròsea**, Hort. (*V. ròsea*, Hort.), a probable variety with pink fls., 2 ft. high and much branched. Hardy in Mass. Prop. by division and cuttings.

Var. **villòsa** (*V. villòsa*, Schrad. *V. crenulàta*, Hoffm.). A Siberian form with narrower lvs. than the type and large blue fls. Lvs. serrate or doubly notched or incised.

18. **spicàta**, Linn. Ascending or erect, slender stems 2–4 ft. high, growing from a shortly creeping, almost woody rootstock: lvs. lanceolate, lance-oblong or the lower ovate, opposite or verticillate, crenate, downy, 1½-2 in. long, thick: racemes long, upright, densely many-fld.: fls. pediceled, clear blue or sometimes pale pink; stamens very long, purple: capsule longer than broad, notched, thick, exceeding the broad hairy sepals. June–Aug. Hilly pastures, Eu. and N. Asia.—Thrives in an open soil away from shade. Regarded as one of the better border Speedwells. Var. **álba** has white fls. Var. **ròsea**, Hort., has showy pink fls. in early autumn.

19. **circæoides**, G. Don. Low, trailing perennial, growing in a dense mass: lvs. lanceolate, crenate toward the apex, small, dark green, numerous: racemes many, 6 in. high: fls. small, dark blue. May, June. Switzerland.—Rare. Considered one of the best. Valuable as a ground cover, as a rock plant or at the front of a herbaceous border.

20. **montàna**, Linn. Mountain Speedwell. Slender, trailing, hairy plant, 12–18 in. long, rooting from the stem: lvs. ovate, petioled, coarsely crenate, hairy, sparse: racemes slender, few-fld., on long pedicels: capsule large, broader than long, slightly notched, exceeding the hairy sepals. May, June. Moist woods, temperate Europe.

21. **officinàlis**, Linn. Common Speedwell. Fluellen. Ground-Hele. Prostrate, leafy native with a pubescent stem rooting at the nodes, slender, 6–18 in. long: lvs. elliptic, oblong or broadly oblong, ½–1 in. long, hairy, serrate at base, evergreen, retaining color where most exposed: racemes slender, densely many-fld.: fls. pale blue, rarely pink, sessile: capsule broader than long, wedge-shaped, broadly notched, hairy, exceeding the hairy sepals. May–July. Forests and mountains of Eu. and N. Amer.—Grows under trees and in shade where no grass will grow, covering the ground with a permanent sod. Spreads rapidly and is easily grown. Prop. by cuttings.

22. **pectinàta**, Linn. Scalloped-leaved Speedwell. Prostrate, white-pubescent, hairy, spreading plant rooting at the nodes, the ascending branches producing single elongated racemes: lvs. obovate or oblong-linear, sometimes pinnatifid, crenate, narrow at the base, sessile, pubescent, ½ in. long: racemes elongated, many-fld.: lower bracts like lvs.: fls. deep blue with a white center: capsule large, longer than broad, notched, pubescent, thick, exceeding the sepals. May, June. Dry, shady hills. Asia Minor.—Suitable to dry spots in a rock-garden. Grows in almost any soil and position.

2659. Veronica longifolia, var. subsessilis (× ¼).

23. **Chamædrys**, Linn. Angel's Eyes. Bird's Eyes. Germander Speedwell. Slender, compact, pubescent species 12–18 in. high, densely ascending from a creeping base: lvs. broadly ovate, sometimes narrower, subsessile, crenate or incised, rounded or cordate at base, hairy, thick, 1½ in. long· racemes 3–6 in. long: fls. large, blue, long-pediceled: capsule longer than broad, widely notched, exceeded by the sepals. May, June. Woods and roadsides, N. and mid-Europe and Canaries. Adventive in this country.—A good border plant.

24. **Teùcrium**, Linn. Hungarian Speedwell. Saw-leaved Speedwell. Stems produced from rhizomes, the sterile prostrate, the floral ascending or erect, white-pubescent, 1 ft. high: lvs. lanceolate or oblong, crenate, sometimes somewhat pinnate, sessile: racemes several, elongated: fls. large, blue, numerous: capsule longer than broad, slightly notched, thick, exceeding the sepals. June. Middle and S. Eu. and Middle Asia.—*V. prostràta*, Linn., formerly considered a separate species by reason of its narrow lvs. and prostrate sterile stems, is connected with *V. Teucrium* by intermediate forms. *V. prostrata* is still used in the trade for a plant with light blue fls. B.M. 3683 (*V. prostrata*. var. *satureiæfolia*).

25. **Austriaca,** Linn. Strong, upright perennial 18–24 in. high, with woolly stems: lvs. mostly deeply pinnatifid, rarely entire or dentate, 2–3 in. long, linear to ovate, the lobes linear or suboblong, narrow at the base: racemes elongated, loosely many-fld., spreading: fls. large, blue: capsule longer than broad, slightly acutely notched, exceeded by the calyx. S. E. Eu. and Asia Minor.—A border plant.

The following trade names cannot be accounted for by the writer: *V. marmorata.*—*V. rupéstris* of the American trade is apparently not V. rupestris of the botanists. This name was first used by Salisbury in 1796 and is a synonym of V. fruticulosa, a plant with terminal racemes. V. rupestris of the trade has axillary, many-fld. racemes. It is a low plant with woody horizontal stem and erect flowering branches 4 or 5 in. high with strict racemes of purplish fls. borne in June and a 4-parted calyx. The capsule is obcordate. This plant has been offered by Rochester nurserymen ever since 1894 and was cult. at Harvard Botanic Garden as far back as 1883. Lvs. narrowly oblong, entire or serrate, ½–1 in. long: calyx segments strongly unequal: pedicels longer than calyx: stem pubescent: lvs. sparsely ciliate, short-petioled.—*V. scabriúscula,* John Saul.—*V. steviæfòlia,* John Saul.—*V. verbenàcea,* a name unknown to Kew authorities in 1901, has been offered by Rochester nurserymen since 1894. Lvs. short-stalked, narrowly elliptic, serrate in upper half: racemes lateral.

A. PHELPS WYMAN.

VERSCHAFFÉLTIA (Ambroise Verschäffelt, 1825–1886, distinguished Belgian horticulturist; founded L'Illustration Horticole at Ghent in 1854 and introduced many choice plants, particularly palms and other foliage plants). *Palmàceæ.* A genus of only 1 species, from the Seychelles, allied to Dypsis but the former is armed and the latter not. The two genera are alike in having 6 stamens and a ruminate albumen, but in Verschaffeltia the ovary is 1-loculed, while in Dypsis it is 3-loculed.

Verschaffeltia is a tall palm, spinose throughout or at length spineless, the slender ringed trunks arising from epigeous roots: lvs. terminal, recurved; blade oblong or cuneate-obovate, bifid, plicate-nerved, usually laciniate nearly to the rachis; segments incised; midrib and nerves strong, scaly; petiole half-cylindrical; sheath long, scaly, deeply split: spadix 3–6 feet long, paniculately branched, long-peduncled, recurved, scaly, its rachis long, and branches and branchlets spreading, slender: spathes 2 or 3, long, sheathing, the lower persistent, the upper deciduous: fls. very small: fr. globose, smooth, 1 in. long.

spléndida, H. Wendl. Caudex 80 ft. high, 6–12 in. in diam., very spiny when young, with many aërial roots: lvs. 5–8 ft. long; petiole 6–12 in. long, pale green; sheath 2½–3½ ft. long, white-granular; blade cuneate obovate, bright green, 4–7 ft. long, 3–5 ft. wide, bifid, deeply incised on the edges. I.H. 12:430; 43:31. F.R. 2:483. R.H. 1869, p. 148.

V. melanochætes, H. Wendl. See Roscheria.

W. M.

VERVAIN. *Verbena.*

VESICÀRIA (Latin, *bladder;* referring to the shape of the pods). *Cruciferæ.* About 20 species of widely scattered herbs with racemes of large, rarely small, yellow or purple flowers of various forms. Sepals equal at the base or laterally subsaccate: silique globose or inflated, many-seeded, and with a slender style: lvs. entire, wavy or pinnately cut. The genus has small horticultural standing, but some of the hardy perennials are said to be well adapted for rockwork and of easy culture. Some are like wall flowers; others resemble alyssum. Both seeds and plants of *V. sinuata* are offered by American dealers, but the plant is imperfectly known. DeCandolle says it is an annual or biennial, while Koch says it is perennial or subshrubby. In the American trade it is considered an early-flowering yellow annual, about 1 ft. high, blooming in May and June.

sinuàta, Poir. Lvs. softly tomentose, oblong-lanceolate, narrowed toward the base, sinuate-dentate or subentire. Spain.—According to DeCandolle the petals finally become whitish.

W. M.

VETCH. See *Vicia.*

VETCH, CROWN. *Coronilla.* **Vetch, Milk.** *Astragalus.*

VÈTRIS. See *Salix.*

VIBÚRNUM (the ancient Latin name). *Caprifoliàceæ.* Ornamental, deciduous or evergreen shrubs, rarely small trees with opposite, petioled and entire, dentate or lobed lvs. and with white fls. in showy cymes, followed by decorative red or blackish berry-like fruits. The Viburnums rank among our most valuable ornamental shrubs. Besides showy flowers and decorative fruits they possess handsome foliage which mostly assumes a bright fall coloring. The plants are of good compact habit. Most of the deciduous species are hardy north, but *V. macrocephalum,* var. *sterile* and *V. obovatum* are tender; also *V. tomentosum, Wrightii, phlebotrichum, cotinifolium, nudum* and *dilatatum* are not quite hardy farther north than New England. Of the evergreen species *V. Japonicum* is the hardiest and stands some degrees of frost. The Viburnums are well suited for borders of shrubberies or planting along roads, and the more showy ones are handsome as single specimens on the lawn. They are mostly medium-sized shrubs, 5–10 ft. high, but *Viburnum Lentago, prunifolium* and *rufidulum* sometimes grow into small trees, 30 ft. high, while *V. acerifolium* hardly reaches 5 ft. The most decorative in fruit are *V. Opulus, dilatatum* and *Wrightii,* with scarlet or red berries which remain a long time on the branches. Besides the Snowball forms, *V. dilatatum, tomentosum, Sieboldi, prunifolium, rufidulum, molle* and *dentatum* are very handsome in bloom. Varieties with all the flowers of the cymes sterile and enlarged are known in the case of *Opulus, tomentosum* and *macrocephalum,* the Common, the Japanese and the Chinese Snowballs. The foliage of most species turns purple or red in fall, that of *V. Opulus* and *acerifolium* being especially brilliant. *V. dilatatum* and *phlebotrichum* assume a dull yellow color. *V. macrocephalum* and *Sieboldi* keep the bright green of their foliage until late in autumn. The Viburnums are not very particular as to soil and position, but most of them prefer a rather moist and sunny situation. Some, as *V. acerifolium, Lantana, dilatatum, Tinus, pubescens* and *prunifolium,* grow well in drier places, while *V. alnifolium* and *pauciflorum* require shade and a porous soil of constant moisture. *V. acerifolium* does well under the shade of trees in rocky and rather dry soil.

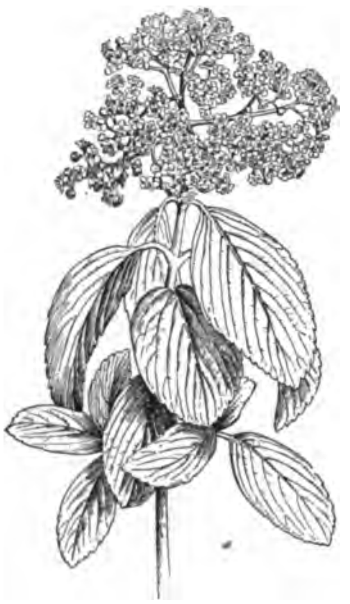
V. Tinus is often grown in pots and thrives in any good loamy and sandy soil. With a little heat it may be forced into bloom at any time in the winter; if not intended for forcing, it requires during the winter a temperature only a little above the freezing point and even an occasional slight frost will not hurt it. The Common and the Japanese Snowball are also sometimes forced and require the same treatment in forcing as other hardy shrubs.

Prop. by seeds sown in fall or stratified; also by greenwood cuttings under glass, especially *V. tomentosum, macrocephalum, molle, cassinoides* and the evergreen species; *V. dentatum* and *Opulus* grow readily from hardwood cuttings and all species can be increased by layers (Fig. 2660); grafting is also sometimes practiced and *V. Opulus, dentatum* and *Lantana* are used as stock.

2660. A layer of Viburnum Opulus, the Common Snowball.

About 100 species in N. and C. America and in the Old World from Europe and N. Africa to E. Asia, distributed as far south as Java. Shrubs or sometimes small trees, with opposite stipulate or exstipulate lvs.; fls. small in terminal paniculate or mostly umbel-like cymes; calyx with 5 minute teeth; corolla rotate or campanulate, rarely tubular; stamens 5: ovary usually 1-loculed: fr. a drupe with a one-seeded, usually compressed stone. In several species the marginal fls. of the cymes are sterile and radiant; such are *V. macrocephalum, tomentosum, Opulus, Sargenti* and *alnifolium*, and of the three first named garden forms are known with all fls. sterile and enlarged.

Alfred Rehder.



2661. Viburnum Sieboldi (× ½).

The familiar Snowball of delightful memory seems to be doomed. It is too much trouble to try to keep off the aphids. Fortunately its place can be taken by a Japanese species that is even more satisfactory. Fig. 2663. The berries of the Japanese species, *V. tomentosum*, are a brilliant scarlet, changing to black. The foliage of this Snowball is also remarkably beautiful. The leaves are olive-green with brownish purple or bronzy margins, and their plicate character makes them very distinct and attractive. The bush is entirely free from insect pests. The single and double forms of the Japanese species differ in the same way that is shown in Figs. 2664 and 2666. Unfortunately they have been confused in many nurseries, and only the trained eye can tell them apart in the nursery row. The double or Snowball type is, of course, the one destined to the greater popularity, though the single form is a shrub of great value, especially for large estates and parks. The double form is known to nurseries as *Viburnum plicatum*, but its proper name is *V. tomentosum*, var. *plicatum*. While it is hardy in New England, it is not a shrub that can be transplanted as easily as many other species. Hence it should be transplanted every second year in the nursery until it is sold. The double form may be propagated by cuttings of half-ripened wood in close frames, or by layers, which in some soils would better remain two years. French nurserymen propagate it by layering. The layers seem to suffer from winter and, to be on the safe side, it is best to cover them well with moss or leaves when the ground is somewhat frozen, so that the frost may be kept in until spring. The clusters are about as big as oranges and pure white. They are in great demand for Decoration Day in New York.

The single form, unlike the double, is easily transplanted. It is also readily propagated by layers or cuttings. Both kinds are hardy in the North and make compact bushes 6–8 ft. high.

J. W. Adams and W. M.

INDEX.

acerifolium, 26.
alnifolium, 13.
Americanum, 28.
Anglicum, 7.
angustifolium, 7.
Awabucki, 3.
Awafuki, 3.
cassinoides, 8.
Claytoni, 7.
cotinifolium, 15.
cuspidatum, 16.
Demetrionis, 23.
dentatum, 21.
dilatatum, 18.
edule, 28.
erosum, 25.
ferrugineum, 10.
Fortunei, 12.
Frœbeli, 4.
grandiflorum, 4.
Hanceanum, 22 and suppl. list.
hirtum, 4.
Japonicum, 1, 16, 17.
Keteleeri, 12.
lævigatum, 6, 21.
Lantana, 14.
lantanoides, 13, 14.
latifolium, 1, 5.
laurifolium, 4.
Laurustinus, 4.
Lentago, 9.
lucidum, 4.
macrocephalum, 12.
macrophyllum, 17.
molle, 22.
multratum, 15.
nanum, 28.
Nepalense, 22.
nitidum, 7.
nudum, 7.
obovatum, 6.
odoratissimum, 3.
opuloides, 28.
Opulus, 28.
Oxycoccus, 28.
parvifolium, 16.
pauciflorum, 27.
phlebotrichum, 20.
pirifolium, 9, 11.
plenum, 16.
plicatum, 16.
prunifolium, 9, 10, 11.
pubescens, 24.
purpureum, 4.
pyrifolium, 9, 11.
reticulatum, 1.
rigidum, 5.
rosaceum, 28.
roseum, 28.
rotundifolium, 16.
rufidulum, 10.
rufo-tomentosum, 10.
rugosum, 5, 14.
Sandankwa, 2.
Sargentii, 29.
scabrellum, 22.
Sieboldi, 1, 17.
squamatum, 8.
sterile, 28.
strictum, 4, 5.
suspensum, 2.
Tinus, 4.
tomentosum, 16.
trilobum, 28.
variegatum, 4.
Vetteri, 9.
virgatum, 4.
Wrightii, 19.

A. *Lvs. penninerved, not lobed.*
B. *Cymes paniculate, broadly pyramidal or semi-globose.*
C. *Foliage deciduous* .... 1. **Sieboldi**
CC. *Foliage evergreen.*
D. *Corolla with cylindrical tube* .... 2. **Sandankwa**
DD. *Corolla rotate-campanulate* .... 3. **odoratissimum**
BB. *Cymes umbel-like, flat (except in the Snowball forms. See Nos. 12, 16, 28.)*
C. *Secondary veins curving and anastomosing before reaching the margin: margin entire or finely serrate.*
D. *Foliage persistent, entire.*
E. *Branches and lvs. glabrous or slightly pubescent* .... 4. **Tinus**
EE. *Branches and lvs. hirsute* .... 5. **rigidum**
DD. *Foliage deciduous.*
E. *Branches and lvs. glabrous or ferrugineously scurfy.*
F. *Lvs. entire or slightly undulate-dentate.*
G. *Cymes sessile: lvs. small* .... 6. **obovatum**
GG. *Cymes peduncled* ... 7. **nudum**
8. **cassinoides**
FF. *Lvs. finely and sharply serrate: cymes sessile, subtended by the upper leaves.*
G. *Petioles mostly with wavy, rather broad margin* .... 9. **Lentago**
GG. *Petioles without or with narrow, not wavy margin.*
H. *Winter-buds and petioles rusty-pubescent* ......10. **rufidulum**
HH. *Winter-buds and petioles not rusty-pubescent*.11. **prunifolium**
EE. *Branches and lvs. stellate pubescent: winter-buds naked* ....12. **macrocephalum**
CC. *Secondary veins prominent, ending in the points of the teeth.*
D. *Winter-buds naked: lvs. with usually numerous small teeth.*

E. *Cymes with the marginal fls. sterile and enlarged* ....13. **alnifolium**
EE. *Cymes with all the fls. fertile.*
F. *Rays of cymes usually 7: cymes flat*..14. **Lantana**
FF. *Rays of cymes usually 5: cymes somewhat convex* ....15. **cotinifolium**
DD. *Winter-buds protected by scales: teeth rather coarse, usually less than 25 on each side.*
E. *Petioles without stipules.*
F. *Cymes with the marginal fls. sterile and enlarged* ....16. **tomentosum**
FF. *Cymes with all fls. fertile and alike.*
G. *Fr. red: lvs. rounded or broadly cuneate at the base.*
H. *Foliage evergreen, glabrous*........17. **Japonicum**
HH. *Foliage deciduous.*
I. *Petiole ½–¾ in. long: fls. almost sessile.*
K. *Lvs. pubescent on both sides*.18. **dilatatum**
KK. *Lvs. almost glabrous* ....19. **Wrightii**
II. *Petioles ⅛–¼ in. long: fls. pediceled, with purple calyx*..20. **phlebotrichum**
GG. *Fr. bluish black: lvs. cordate or rounded at the base.*
H. *Branches and lvs. glabrous* ....21. **dentatum**
HH. *Branches and lvs. beneath pubescent*............22. **molle**
EE. *Petioles with stipules, sometimes rather small and caducous.*
F. *Lvs. long-petioled: blades to 3½ in. broad* ....23. **Demetrionis**
FF. *Lvs. short-petioled: blades to 1¾ in. broad.*
G. *Cymes short-peduncled, dense*.......24. **pubescens**
GG. *Cymes long-peduncled, loose*........25. **erosum**
AA. *Lvs. palmately 3–5-nerved, usually 3-lobed, slender-petioled.*
B. *Fls. all perfect.*
C. *Habit strictly upright: fr. purplish black* ....26. **acerifolium**
CC. *Habit straggling: fr. scarlet*.27. **pauciflorum**
BB. *Marginal fls. sterile, radiant*.28. **Opulus**
29. **Sargentii**

1. **Siéboldi,** Miq. Fig. 2661. Deciduous shrub, attaining 10 ft., with stout branches, pubescent when young: lvs. oval to oblong-obovate, coarsely crenate-serrate except toward the base, acute, dark green and shining above, paler and stellate-pubescent beneath, 3–6 in. long: fls. white, rotate-campanulate, in panicles 2½–4 in. broad: fr. oblong, changing from pink to bluish black. May, June. Japan. G.F. 2:559.—Hardy shrub of vigorous growth with handsome dark green foliage, large for the genus, exhaling a disagreeable odor when bruised. The fruits drop soon after ripening. It is known in some nurseries as *V. Japonicum*, *V. latifolium* or *V. Japonicum latifolium*. Var. **reticulàtum,** Rehd. (*V. reticulatum*, Hort.). Smaller in every part: lvs. of lighter green, less pubescent: half-hardy. Var. **variegàtum,** Hort. Lvs. variegated with white.

2. **Sandánkwa,** Hassk. (*V. suspénsum*, Hort.). Evergreen shrub, attaining 6 ft., with slender warty branches: lvs. oval to oval-oblong, acute or obtusish, usually remotely crenate-serrate toward the apex, shining and dark green above, paler beneath, glabrous, 2–4 in. long: fls. white, tinged pink, in dense semi-globose panicles becoming 1½ in. high; corolla ⅓ in. long, with cylindric tube twice as long as limb: fr. red, subglobose. June, July. Loochoo Isl. B.M. 6172.—Tender.

3. **odoratissimum,** Ker. (*V. Awabúcki* and *Awafùki*, Hort.). Evergreen upright shrub, attaining 10 ft., with stout warty branches, glabrous: lvs. elliptic to elliptic-oblong, acute, remotely serrate toward the apex or entire, shining and bright green above, paler beneath, glabrous, 3–6 in. long: fls. pure white, fragrant, in broadly pyramidal panicles 4 in. high; corolla rotate-campanulate: fr. red, changing to black. May, June. India to S. China and Japan. B.R. 6:456.—Tender.

4. **Tìnus,** Linn. (*V. Laurustìnus*, Hort. *Tìnus laurifòlius*, Borckh.). LAURUSTINUS (or LAURESTINUS). Bushy, 10 ft., with glabrous or somewhat hairy branches: lvs. ovate-oblong or oblong, acute, dark green, shining and glabrous above, pubescent beneath usually only on the veins, 2–3 in. long: fls. white or pinkish white, slightly fragrant: cymes somewhat convex, 2–3 in. broad: fr. ovoid, black, rather dry. May–Aug., or in the greenhouse in early spring and winter. Mediterranean region. B.M. 38.—Handsome free-flowering shrub, often cult as a pot-plant north. Var. **Frœbeli,** Nichols. Compact form with light green lvs. and pure white fls. Var. **hirtum,** Ait. Lvs. pubescent beneath and ciliate. Var. **lùcidum,** Ait. (*V. lùcidum*, Mill. *V. grandiflòrum*, Hort.). Lvs. and cymes larger, more tender and not adapted for forcing. Gn. 15, p. 196. Var. **purpùreum,** Hort. Lvs. suffused with a dull purple tinge. Var. **strictum,** Loud., not Ait. Of erect and fastigiate habit. Var. **virgàtum,** Ait. Lvs. oblong-lanceolate, pubescent on the margin and on the veins beneath. Var. **variegàtum,** Hort. Lvs. variegated.

5. **rìgidum,** Vent. (*V. rugòsum*, Pers. *V. latifòlium*, Hort. *V. Tìnus*, var. *strictum*, Ait.). Shrub, attaining 6 ft., with spreading hirsute branches: lvs. broadly ovate to ovate-oblong, acute or obtusish, pubescent on both sides when young, almost glabrous above at length and wrinkled, 3–6 in. long: fls. pure white: cymes large, 3–4 in. broad: fr. oval, bluish black. May–July. Canary Isl. B.R. 5:376. L.B.C. 9:859. B.M. 2082. A.G. 1893:456.—Less handsome and less free-flowering than the preceding species.

6. **obovàtum,** Walt. (*V. lævigàtum*, Ait.). Shrub, attaining 8 ft., with spreading branches: lvs. almost sessile, obovate to oblanceolate, obtuse or retuse, coriaceous, glossy, entire or obscurely crenate toward the apex, ½–1½ in. long: fls. white, in sessile cymes 1–2 in. broad: fr. oval, black. April–June. Va. to Fla. L.B.C. 15:1496.—Tender.

7. **nùdum,** Linn. (*V. nùdum*, var. *Clàytoni*, Torr. & Gray). Upright shrub, sometimes attaining 15 ft.: lvs. oval to obovate or oval-lanceolate, acute or obtuse, usually entire and somewhat revolute or obscurely crenulate, thickish, scurfy on both sides when young, glabrous above at length: fls. white or yellowish white: cymes rather long-peduncled, 3–5 in. broad: fr. globose, pink at first, changing to dark blue. June, July. Long Island to Fla., west to Ky. and La. B.M. 2281.—Not quite hardy north. Var. **nitidum,** Zabel (var. *angustifòlium*, Torr. & Gray. *V. nitidum*, Ait. *V. Anglicum*, Hort.). Lvs. smaller and narrower, more shining above and firmer.

8. **cassinoides,** Linn. (*V. nùdum*, var. *cassinoides*, Torr. & Gray. *V. squamàtum*, Willd.). WHITE ROD. APPALACHIAN TEA. Upright shrub, 2–6, occasionally 12 ft. high: lvs. oval or ovate to oblong, acute or bluntly acuminate, usually obscurely dentate, almost glabrous, rather thick, dull green above, 1–3 in. long: fls. and fr. almost like those of the preceding species, but peduncle shorter, usually shorter than cyme; blooming a little earlier. June, July. Newfoundland to Manitoba and Minn., south to N. C. G.F. 9:305. Em. 2:411 (as *V.*

nudum).—A good shrub for borders of shrubberies; hardy.

9. **Lentàgo**, Linn. SHEEP-BERRY. NANNY-BERRY. Fig. 2662. Shrub or small tree, attaining 30 ft., with slender branches: winter-buds long-pointed: petioles mostly with wavy margin: lvs. ovate, acuminate, glabrous or scurfy at the veins beneath, 2–4 in. long: fls. white: cymes sessile, 2–5 in. broad: fr. oval, bluish black, with bloom. May, June. Hudson Bay to Manitoba, south to Ga. and Miss. S.S. 5:223, 224.—Hardy, large, often arborescent shrub, keeping its fruits until spring. Sometimes as *V. prunifolium* and *pyrifolium* in gardens A garden hybrid, originated in Germany, is *V. Vétteri*, Zabel (*V. Lentago* X *nudum*), similar in habit to this species but the cymes on short peduncles over ½ in. long.

10. **rufidulum**, Raf. (*V. prunifòlium*, var. *ferrugineum*, Torr. & Gray. *V. ferrugineum* and *rufo-tomentosum*, Small). Large shrub or small tree, attaining 25 ft. or more, with rather stout branches: winter-buds scarcely pointed, obtuse, rusty-pubescent: petioles often with narrow margin, rusty tomentose: lvs. elliptic to obovate, usually obtuse, glabrous and shining above, rusty-pubescent on the veins beneath, 2–4 in. long: fls. pure white: cymes 3–5 in. broad: fr. oval, dark blue, glaucous, ½ in. long. April–June, later than the following species. Va. to Fla., west to Ill. and Texas. S.S. 5:225 (as *V. prunifòlium*, partly).—Handsome arborescent shrub with dark green shining foliage, showy fls. and decorative fr.; has proved hardy at the Arnold Arboretum, Boston.

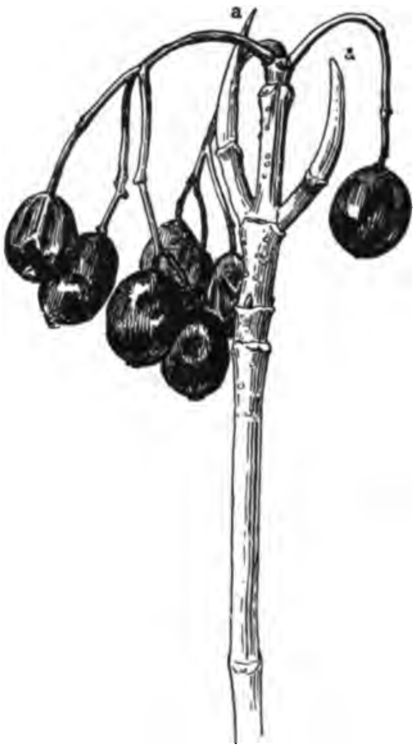
11. **prunifòlium**, Linn. (*V. pyrifòlium*, Poir.). BLACK HAW. STAG-BUSH. Shrub or small tree, attaining 15 ft., with spreading, rather stout branches: winter-buds short-pointed, glabrous or reddish, pubescent: lvs. broadly oval to ovate, acute or obtuse, glabrous or nearly so, 1–3 in. long; petioles often with narrow margin, glabrous: fls. pure white: cymes sessile, 2–4 in. broad fr. oval to subglobose, bluish black and glaucous, little over ½ in. long. April–June. Conn. to Fla., west to Mich. and Tex. A.F. 12:1100. Gng. 5:310.

12. **macrocéphalum**, Hort. Shrub, attaining 12 ft. and occasionally more with spreading branches: lvs. short-petioled, oval to ovate-oblong, rounded at base, acute, denticulate, almost glabrous and dark green above, stellate-pubescent beneath, 2–4 in. long: fls. yellowish white, in peduncled cymes, 3–5 in. across, with the marginal fls. sterile and radiant. May, June. China.—Var. **Keteleèri**, Nichols. (*V. Keteleèri*, Carr.). The typical form with only the marginal fls. sterile and enlarged; has proved hardy at the Arnold Arboretum. R.H. 1863, p. 270. Gn. 45, p. 423. Var. **stérile**, Dipp. (*V. Fòrtunei*, Hort.). CHINESE SNOWBALL. All the fls. sterile, forming a subglobose ball, sometimes 7 or 8 in. across. B.R. 33: 43. F.S. 3:263, 264. R.H. 1858, p. 350. Gn. 34, p. 348; 45, p. 422; 56, p. 82. G.C. III. 25:suppl. June 3.—A very showy variety, but not hardy north.

13. **alnifòlium**, Marsh. (*V. lantanoides*, Michx.). HOBBLE-BUSH. AMERICAN WAYFARING TREE. Low shrub, sometimes 10 ft. high, with wide-spreading, often procumbent branches, scurfy-pubescent when young: lvs. orbicular or broadly ovate, cordate at the base, short-acuminate or acute, irregularly serrulate, minutely pubescent or almost glabrous above, scurfy pubescent beneath, 3–8 in. broad: fls. white: cymes sessile, 3–5 in. broad; marginal fls. enlarged and sterile, long-pediceled: fr. ovoid-oblong, dark purple. May, June. New Brunswick and Mich. to N. C.—Handsome shrub, with very large foliage, assuming a deep claret-red in fall.

14. **Lantàna**, Linn. WAYFARING TREE. Upright shrub or sometimes small tree, attaining 20 ft.: young branches scurfy-pubescent: lvs. ovate or oblong-ovate, usually cordate at base, acute or obtuse, sparingly stellate-pubescent and wrinkled above, tomentose beneath, denticulate, 2–4 in. long: fls. white: cymes dense, 2–3 in. broad, with usually 7 rays: fr. ovoid-oblong, bright red, changing to almost black. May, June. Eu., W. Asia. A.G. 18:453 and F.E. 9:593 (as *V. lantanoides*).—Hardy shrub, especially for drier situations and limestone soil. Var. **rugòsum**, Hort. With larger and very wrinkled lvs. and larger cymes. There are a number of other vars., including some with variegated leaves.

15. **cotinifòlium**, D. Don (*V. multràtum*, C. Koch). Shrub, attaining 6 ft., with spreading branches, tomentose when young: lvs. orbicular-ovate to ovate, cordate or rounded at the base, usually obtuse, crenulate-dentate or almost entire, wrinkled above and nearly glabrous at length, tomentose beneath, 2–5 in. long: fls. white, tinged with pink, in cymes 2–3 in. broad, with usually 5 rays; corolla rather larger, funnelform-campanulate, tube longer than limbs: fr. ovoid-oblong, red, changing to black. May, June. Northwest Himalayas. B.R. 19:1650. G.F. 5:245.—Not quite hardy north, requiring protection near Boston.



2662. Viburnum Lentago. Nearly full size.

16. **tomentòsum**, Thunb. (*V. plicàtum*, Miq.). Strong-growing shrub, attaining 8 ft., with spreading branches, tomentose when young: lvs. broadly ovate to oblong-ovate, sometimes obovate, acute or abruptly acuminate, dentate-serrate, dark green and almost glabrous above, stellate-pubescent beneath, sometimes only on the veins, 1½–4 in. long: cymes 2–3 in. broad, long-peduncled; sterile fls. long-pediceled: fr. ovoid, red, changing to bluish black. June. China, Japan. S.Z. 1:38. G.F. 4:594, 595. A.F. 12:1101. Gng. 5:311. M.D.G. 1898:400. S.H. 2:502.—A beautiful hardy shrub, with handsome foliage and showy fls.; the fruits, too, are decorative, especially before they change to black. In some nurseries erroneously named *V. Japonicum*. Var. **cuspidàtum**, Sieb. & Zucc. (*V. plicàtum*, var. *parvifòlium*, Miq.). Lvs. elliptic to oblong, long-acuminate, 1–2 in. long. Of slow growth and blooms sparingly. Var. **plicàtum**, Maxim. (*V. plicatum*, var. *plènum*, Miq. *V. plicàtum*, Thunb.). JAPANESE SNOWBALL. Fig. 2663. All fls. sterile, forming large, globose balls 2½–3 in. across. F.S. 3:278. B.R. 33:51. A.G. 18:357. Gng. 1:263. V.M. 6:294. M.D.G. 1898:401. S.H. 2:503, 505. Var. **rotundifòlium**, Hort. Much like the preceding var., but lvs. broader and blooming about 2 weeks earlier. There is also a variegated form.

17. **Japónicum**, Spreng. (*V. macrophýllum*, Blume). Upright shrub, to 6 ft., with glabrous branches: lvs. broadly or rhombic-ovate to oblong-ovate, acute or shortly acuminate, remotely dentate except at the base, 3–6 in. long: fls. in short-peduncled, glabrous cymes 2–4 in. broad: fr. globose, red. June. Japan.—Handsome large-leaved shrub, but not hardy north. Evergreen.

2663. Viburnum tomentosum, var. plicatum — Japanese Snowball. V. plicatum of gardens (× ½).

18. **dilatàtum**, Thunb. Upright bushy shrub, attaining 10 ft., with the branches hirsute when young: lvs. roundish or broadly ovate or obovate, usually abruptly short-pointed, coarsely toothed, pubescent on both sides, 2–5 in. long: fls. pure white, in short-stalked cymes, 3–6 in. broad; corolla pubescent outside: fr. ovate, scarlet, ⅓ in. long. May, June. China, Japan. B.M. 6215. G.F. 4:150. M.D.G. 1899:241, 242. A.F. 15:123.—Handsome hardy free-flowering shrub, especially decorative with its numerous scarlet fruits remaining a long time on the branches.

19. **Wrìghtii**, Miq. Upright shrub, to 10 ft. high, with the branches almost glabrous: lvs. almost orbicular or broadly obovate to ovate, abruptly acuminate, coarsely dentate, almost glabrous except on the veins beneath, 3–5 in. long: fls. rather large, white, in usually short-stalked, 2–4 in. broad cymes; corolla glabrous outside: fr. globose, red. May, June. China, Japan.—Hardy shrub, similar to the preceding, but of less dense habit, with larger fruits in nodding cymes.

20. **phlebótrichum**, Sieb. & Zucc. Upright shrub, attaining 5 ft., with glabrous branches: lvs. ovate to oblong, acuminate, dentate except at the base, glabrous above, with long appressed hairs on the veins beneath, 2–3 in. long: fls. white, with purple calyx, mostly slender-pediceled and nodding, in few-fld., long-peduncled cymes: fr. globose. May, June. Japan, China.—Not quite hardy north.

21. **dentàtum**, Linn. Arrow-wood. Upright bushy shrub, attaining 15 ft., with glabrous branches: lvs. rather long-petioled, orbicular to ovate, acute or shortly acuminate, coarsely dentate, glabrous or pubescent only in the axils of the veins beneath, 1½-3 in. long: fls. in long-peduncled, glabrous cymes, 2–3 in. broad: fr. sub-globose, bluish black, glaucous. May, June. New Brunswick to Minn., south to Ga. G.F. 10:332. Em. 2:414.—Handsome native shrub, thriving best in moist soil. *V. lævigatum* of some nurseries, not Ait., has somewhat larger lvs. and seems to bloom later.

22. **mólle**, Michx. (*V. scabréllum*, Chapm. *V. Nepalénse*, Hort.). Similar to the preceding, but branchlets, cymes and under side of lvs. stellate-pubescent: lvs. larger, with stouter petioles, dark green: peduncles stouter: teeth of calyx more prominent: fr. large and more pointed: blooms 2–3 weeks later. Mass. to Fla. and Tex. G.F. 4:30.—Handsomer than the preceding on account of its larger darker green foliage and more robust habit. In gardens sometimes confounded with *V. pubescens* and sometimes found under the erroneous name of *V. Hanceanum*. See supplementary list.

23. **Demetriònis**, Deane & Rob. Shrub, attaining 12 ft.: lvs. orbicular or broadly ovate, cordate, shortly acuminate, coarsely dentate, pubescent beneath or almost glabrous, 2½–4½ in. long: cymes long-peduncled, puberulous, about 2½ in. broad: fr. oblong, almost ½ in. long. Mo. B.B. 3:231.

24. **pubéscens**, Pursh. Bushy shrub, 3–6 ft. high, with slender, upright branches: lvs. oval to ovate, rounded or cordate at base, acute or acuminate, coarsely dentate, almost glabrous above, pubescent beneath, 1½–2½ in. long: cymes short-peduncled, dense, 1½–2½ in. broad: stamens exceeding the corolla about one-half: fr. oval, almost black, slightly flattened. June, July. Quebec to Ga., west to Manitoba and Ill. G.F. 3:125. A.F. 12:1101. Gng. 5:311.—Handsome shrub of compact habit.

25. **eròsum**, Thunb. Upright shrub, attaining 6 ft., with slender, much-forked branches: lvs. oblong-ovate or oblong-obovate, narrowed toward the base, acuminate, dentate-serrate, pubescent beneath at least on the veins, 2–3½ in. long: cymes 2½–3 in. broad, rather loose, long-peduncled: stamens little or not exceeding the corolla: fr. subglobose, red. May. Japan, China. G.F. 9:85.

26. **acerifòlium**, Linn. Dockmackie. Shrub, attaining 5 ft., with slender, upright branches: lvs. orbicular or ovate, 3-lobed, with acute or acuminate lobes, coarsely dentate-serrate, pubescent or at length almost

glabrous, 2–5 in. long: fls. yellowish white: cymes long-peduncled, terminal, 1½–3 in. broad: fr. almost black, ovoid. May, June. New Brunswick to Minn., south to N. C. Em. 2:414.—It grows fairly well in drier situations under trees. The foliage assumes a handsome dark purple fall color.

2664. Viburnum Opulus (× ¼).

Single form of the common Snowball as it grows in the wild.

27. **pauciflòrum**, Raf. Straggling shrub, attaining 5 ft.: lvs. orbicular to oval, coarsely dentate, with 3 short lobes above the middle or often without, glabrous or slightly pubescent beneath when young, 2–3½ in. long: cymes few-fld., small, on lateral, short, usually 2-lvd. branchlets: fr. scarlet, subglobose. June. Labrador to Alaska, south to Vt. and Colo. in the mountains. G.F. 3:5.—It does not usually succeed well in cultivation; requires shade and moist porous soil.

28. **Ópulus**, Linn. (*V. Americànum*, Mill. *V. trìlobum*, Marsh. *V. opuloìdes*, Mühl. *V. édule*, Pursh. *V. Oxycóccus*, Pursh.). Cranberry-bush. High Cranberry. Figs. 2664, 2665. Shrub, attaining 12 ft., with rather smooth light gray branches and stems: lvs. broadly ovate, 3-lobed, with coarsely dentate-serrate, acuminate lobes, pubescent or almost glabrous beneath, 2–4 in. long: fls. white, in peduncled cymes, 3–4 in. broad: fr. subglobose to oval, scarlet. May, June. New Brunswick to Brit. Col., south to N. J. and Ore.; also in Eu. and Asia.—Handsome native shrub, very decorative in fruit, which begins to color by the end of July, remains on the branches and keeps its bright scarlet color until the following spring. The berries are not eaten by birds. Var. **nànum**, Jacq. A very dwarf, compact, small-leaved form; flowers but very rarely. Var. **stérile**, DC. (*V. ròseum*, and *rosàceum*, Hort.). Guelder Rose, Snow-ball. Fig. 2666. All fls. sterile, forming large, globose heads. Gng. 1:9. Gn. 56, p. 83.—This is a very showy var., but it lacks the decorative fruits. There are also variegated forms of the type and of the sterile variety. The American Cranberry-bush is considered by some botanists a distinct species under the name *V. Americanum*, Mill., but differs little from the European form, chiefly by the more vigorous growth, by the petioles having a shallow rather broad channel and small glands, and by the shorter peduncles and shorter stamens.

2665. Fruits of Viburnum Opulus (× ¼).

29. **Sárgentii**, Koehne. Similar to the preceding, of more upright, denser habit: bark of stems darker, fissured and somewhat corky, young branchlets with prominent lenticels: lvs. of thicker texture, pubescent or glabrous beneath, the upper lvs. with much elongated and usually entire middle lobe and small, short, spreading lateral lobes; petioles with large glands: sterile fls. larger, sometimes to 1¼ in. across; anthers purple: fr. globose, in usually upright cymes. N. China, Japan. —Introduced under the name *Viburnum Opulus* from Pekin. It does not seem to fruit as profusely as *V. Opulus*.

V. Burejæticum, Herd. & Regel (V. Burejanum, Herd.). Similar to V. Lantana. Lvs. narrower toward the base, venation like that of V. macrocephalum: cyme with 5 rays: fr. pinkish or yellowish. May, June. Eastern Siberia, Amurland. Gt. 11:384.—*V. cordifòlium*, Wall. Similar to V. alnifolium, but cymes without radiant fls.: lvs. narrow: blooming before the lvs. Himalayas.—*V. Dahùricum*, Pall. Shrub, attaining 6 ft.: lvs. broadly ovate to oval, 1½–2¼ in.: fls. funnelform, in short, small panicles: fr. finally black. Dahur. to W. China. —*V. densiflòrum*, Chapm. Closely allied to V. acerifolium. Lower: lvs. smaller, 1–2 in., with mostly shorter lobes or none: cymes denser. W. Fla.—*V. ellípticum*, Hook. Shrub, attaining 5 ft., allied to V. acerifolium, but lvs. not lobed, oval to elliptic-oblong: fr. oblong-oval, almost ½ in. long. Wash. to Calif.—*V. furcàtum*, Blume. Closely allied to V. alnifolium, but of upright habit and stamens shorter than corolla. Jap., China.—*V. Hanceànum*, Max. Allied to V. tomentosum: lvs. broader, with few teeth above the middle. S. China. Tender. Seems not in cultivation. See No. 22.—*V. orientàle*, Pall. Allied to V. acerifolium: shrub, attaining 4 ft.: lvs. with simple, not fascicled hairs on the veins beneath and not glandular dotted beneath: fr. red. June, July. W. Asia. Gt. 17:567.

Alfred Rehder.

2666. Snowball—Viburnum Opulus, var. sterile (× ¼).

All the fertile flowers are changed to sterile, showy ones.

VÍCIA (classical Latin name). Vetch. Tare. More than 100 species of herbs, mostly climbing, with pinnate foliage, closely allied to Lathyrus, Pisum and Lens, but differing in minute floral characters: wings adhering to the keel; style very slender, with beards or hairs all around the upper part or only at the apex; pod flat, 2–many-seeded, 2-valved and dehiscent, the seeds either globular or flattish; stamens diadelphous (9 and 1). Flowers mostly blue or violet, sometimes yellowish or white. The Vicias are widely spread in the northern hemisphere and some of them in South America. About two dozen species occur in North America, some of the species introduced. Most of the Vicias are weedy or insignificant looking plants, but a few are grown for the bright flowers, others of late for green-manure crops (see *Cover-Crops*), and one (*V. Faba*) is a garden bean. The species are mostly cool-season plants of easy culture. The interest in the Vetches in this country is mostly for their value as soil covers and for foliage. *V. sativa* and *V. villosa* are the important species here at present.

A. *Plant stiff and erect, usually bearing no tendrils, cultivated for the beans (Faba).*

Fàba, Linn. (*Fàba vulgàris*, Moench. *F. sativa*, Bernh.). BROAD BEAN. WINDSOR BEAN. ENGLISH DWARF BEAN. Figs. 190, 191, Vol. I. Strong, erect annual, 2–4 ft., glabrous or nearly so, very leafy: leaflets 2–6, the lower ones not opposite on the rachis, the terminal one wanting or represented by a rudimentary tendril, oval to elliptic and obtuse or mucronate-pointed: fls. in the axils, dull white and with a large blue-black spot; pods large and thick, from 2 or 3 inches even to 18 in. long, the seeds large and often flat. Probably native to northern Africa and S.W. Asia.—Much grown in the Old World, but the hot dry summers prevent its cultivation in most parts of the U. S. It is grown successfully in parts of Canada, particularly in the maritime provinces. The plant is grown mostly for cattle feeding, although the beans may be used, both full grown and immature, for human food. This bean has been cult. from prehistoric times and its nativity is in doubt. The plant is hardy and seeds should be sown early, when the season is cool.

AA. *Plant weak, usually climbing by means of tendrils that represent leaflets.*

B. *Fls. about 2 in the axils, sessile or nearly so.*

sativa, Linn. SPRING VETCH or TARE. Annual or biennial, not surviving the winter in the North, more or less pubescent, 2–3 ft. high: lfts. 7 pairs or less, elliptic, oblong or oblanceolate, mostly truncate and apiculate at the top, the tendril part of the leaf extended: fls. usually 2 in each axil, about 1 in. long, purplish: pods 2–3 in. long when mature. Eu., and naturalized in some parts of the U. S.—Much cult. abroad as a forage plant; in this country grown for similar purposes and also somewhat as a cover-crop for orchards. Seeds sometimes used for making flour. There is a white-seeded and also a large-seeded variety.

2667. Vicia villosa, the Hairy Vetch (× ⅓).

BB. *Fls. several to many in peduncled clusters.*

C. *Blossoms small and usually not very showy, mostly bluish, in loose often 1-sided clusters: plants grown mostly for forage or in wild gardens.*

D. *Leaflets usually less than 9 pairs.*

villòsa, Roth. HAIRY or WINTER VETCH. Fig. 2667. Annual or biennial (sometimes perennial ?), enduring the winters in the North, villous-pubescent: lfts. 5–7 or more pairs, elliptic-oblong, rounded at the tip but usually ending in a very minute point: fls. violet-blue, in long 1-sided axillary racemes. Eu., Asia.—Now considerably used as a cover-crop.

Americàna, Muhl. Perennial, nearly or quite glabrous: lfts. elliptic to oblong, obtuse or sometimes emarginate at the apex: fls. purplish, about ¾ in. long, in few-fld. loose racemes. Moist lands across the continent and as far south as Ky.—Has been offered by dealers in native plants.

Caroliniàna, Walt. Perennial, nearly or quite glabrous: lfts. oblong to linear-oblong, usually obtuse or emarginate: fls. nearly white, ⅓ in. or less long, in several- to many-fld. loose racemes. Minn. and Kans. eastward.—Has been offered.

oroboides, Wulf. (*Ŏrobus lathyroides*, Sibth. & Sm.). Perennial, 2–3 ft. tall: lvs. 3–5 pairs, oval-lanceolate, very acute: fls. handsome, violet-blue, small, in 2 or 3 short clusters each axil.

DD. *Leaflets usually 9 or more pairs on full-sized lvs.*

gigantèa, Hook. Perennial, pubescent, high-climbing: lfts. 10–15 pairs, narrow-oblong, obtuse and mucronulate: fls. about ½ in. long, pale purple, in 7–18-fld. racemes. Calif. and north.—Has been offered by dealers in natives.

Cràcca, Linn. Perennial, usually pubescent: lfts. 9–12 pairs, thin, linear to oblong, mucronate: fls. purplish, about ½ in. long in a rather dense raceme. Across the continent and south to Ky.; also in Eu. and Asia.—Offered by some dealers.

Gerárdi, Vill. Described as a hardy annual: pubescent: lfts. numerous, narrow-oblong, very obtuse but with a short mucro: fls. violet, small, in short racemes. S. Eu.—Offered by seedsmen as a flower-garden subject.

CC. *Blossoms red and showy, in dense spikes or spike-like racemes: flower-garden subject.*

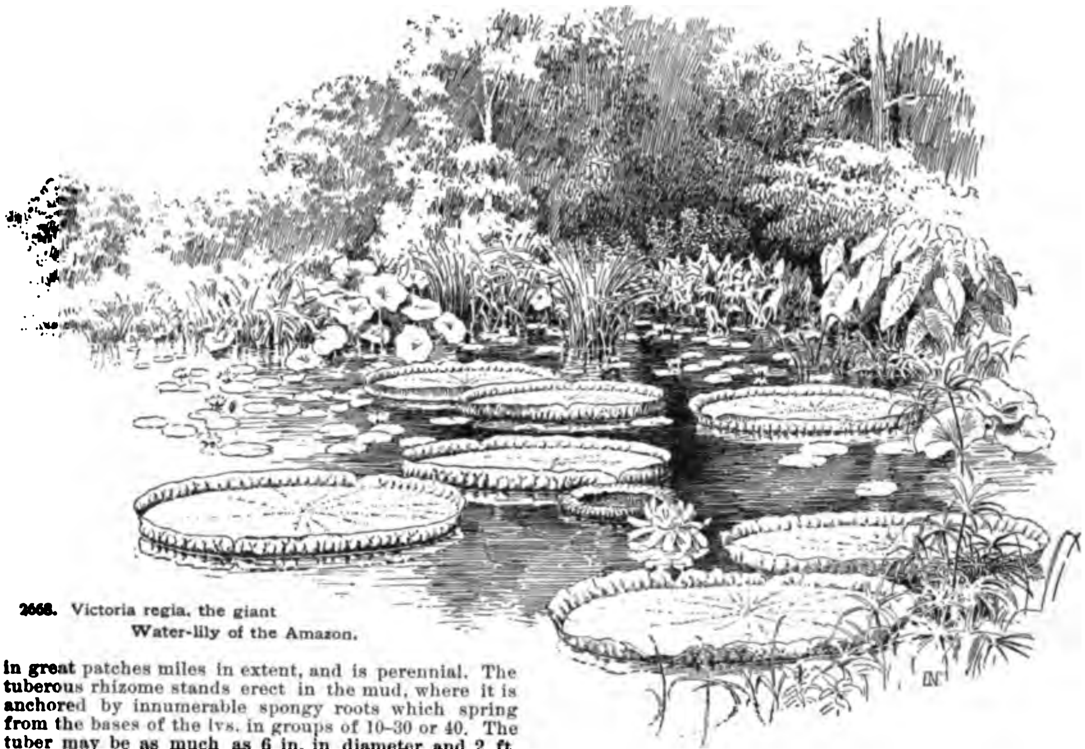
fúlgens, Batt. Annual, 3–5 ft., pubescent: lfts. 8–12 pairs, oblong or lance-linear, mucronate: fls. small, red or nearly scarlet and purple-striped, in a compact raceme or spike. Algeria.—Recently introduced.

L. H. B.

VICK, JAMES (Plate XLI), seedsman and editor, was born at Portsmouth, Eng., Nov. 23, 1818, and died at Rochester, N. Y., May 16, 1882. He came to America at the age of 12, learned the printer's trade, and in 1850 became editor of the "Genesee Farmer," then published at Rochester by Luther Tucker and subsequently absorbed by "The Cultivator." In 1853 he purchased Downing's magazine, "The Horticulturist," and published it for a time, the editor being Patrick Barry. In 1860 Vick entered the seed business and his trade soon grew to large proportions. For about 20 years his name was a household word, being associated especially with flowers. In 1878 he founded "Vick's Magazine," which is still published. Vick's personality was thoroughly amiable, and his letters in "Vick's Magazine" to children and to garden lovers everywhere show the great hold he had on the hearts of the people.

W. M.

VICTÒRIA (in honor of Queen Victoria). *Nymphæàceæ.* ROYAL WATER-LILY. This remarkable aquatic genus may be recognized by its huge, round, floating leaves often 6 feet or more in diameter, with the margin turned up at right angles to the water surface to a height of 3–8 inches, making a basin-like object. The fls. (12–18 in. across) are nocturnal, opening on two successive days about 4.30 P. M. and remaining open until the middle of the following morning. The first evening the inner floral lvs. remain loosely closed over the stigma, the flower is pure creamy white, and exhales a delicious fragrance somewhat resembling a rich pineapple; the second evening the floral lvs. spread widely open, and the color changes to pink or even a deep red. The ovary is inferior, densely prickly, and surmounted by a short, broad tube, on the sides and summit of which the floral lvs. are situated. Sepals 4; petals 50–70, obtuse, oblong-ovate to sublinear, rather thin and delicate in texture; staminodia about 20; stamens 150–200, linear-lanceolate: paracarpels about 25, forming a ring of thick, fleshy bodies between the stamens and the styles: carpels 30–40; stigma forming a broad, basin-like depression, 2–2⅓ in. wide, in the midst of the flower, with a central conical continuation of the floral axis, the basin filled with fluid on the first evening of opening: carpellary styles broad and fleshy in the lower part, produced upward to a fleshy, subulate, incurved process about ⅓ in. long. In fruit all of the floral lvs. have decayed away, leaving the basal tube of the torus at the top of a great prickly berry, half the size of one's head. The seeds are greenish or brownish black, about the size of a pea. The genus is represented by 2 well-defined species, inhabiting still waters of South America from British Guiana to Argentina.



2668. Victoria regia, the giant Water-lily of the Amazon.

In its native haunts Victoria grows in 4–6 ft. of water, in great patches miles in extent, and is perennial. The tuberous rhizome stands erect in the mud, where it is anchored by innumerable spongy roots which spring from the bases of the lvs. in groups of 10–30 or 40. The tuber may be as much as 6 in. in diameter and 2 ft. long. It decays below as it grows above. The lvs. are arranged in 55–144 order, and the flowers arise in a parallel but independent spiral of the same order (Planchon). Each leaf after the first seedling leaf has a broadly ovate, fused pair of stipules, these organs serving to protect the apex of the stem. The petioles and peduncles are terete, about 1 in. in diam., covered with stout, fleshy prickles, and traversed internally by 4 large, and a number of smaller, air canals. The petioles attain to a length much greater than the depth of the water, so that the lvs. can adjust themselves to changes of the water-level, though Banks states that they may be completely submerged in times of flood. The gigantic lvs. are covered beneath with a close network of prickly veins, the larger of which project an inch or more from the leaf-surface; the tissues are full of air-spaces and canals, thus buoying up the mass of cellular matter. Besides many stomata on the upper surface of the leaf, which open into the air-chambers of the mesophyll, there are innumerable tiny depressions, in each of which one can see with a hand-lens that the leaf is perforated with a fine hole; these holes were termed by Planchon "stomatodes" (F.S. 6:249). He considered them to be useful as air-holes to let out gases which, rising from the water or mud, might be caught in the deep meshes of the netted veins on the under side of the leaf. It is also to be noted that, in spite of the cup-like form of the leaves, water from rain or other sources does not remain on the surface; it doubtless runs down at once through the tiny perforations. This would be an indispensable protection to the leaf against fungous foes and in the function of assimilation.

A single leaf, by its buoyancy, may sustain a weight of 150 or 200 pounds. Not the least remarkable feature of these leaves is their rate of growth. Caspary found the maximum growth in length to be about 1 inch per hour when the leaf is just expanding; the surface increases 4 or 5 sq. ft. in 24 hours, and a plant will produce in 21 to 25 weeks 600 or 700 sq. ft. of leaf-surface. A great development of heat has been observed in the opening flowers of Victoria. About 8 P. M., when the anthers are shedding their pollen (in second-day flowers), the stamens may reach and maintain a temperature 10° F. above that of the surrounding air.

Though doubtless known to Spanish traders and missionaries, and certainly of use to savages as food in quite early times, Victoria was first noticed botanically by Haenke in Bolivia about 1801; but he died in the Philippines without recording his discovery. Bonpland, the companion of Humboldt, also saw it, near Corrientes, Argentina, in 1819, but still it was neglected. In 1832 Poeppig found it on the Amazon, and described it as *Euryale Amazonica*. D'Orbigny saw the plant in 1827 at Corrientes, and in 1833 in Bolivia, and several years later published accounts of his find. Robert H. Schomburgk, finding it again in 1836 on the Berbice river in British Guiana, sent home specimens and figures from which Lindley in 1837 (published in 1838) established the genus Victoria and described the species *V. regia*. This name has settled upon the northern species, while the one found at Corrientes was named in 1840, by d'Orbigny, *V. Cruziana* in honor of General Santa Cruz, of Bolivia.

The struggle to bring the "Queen of Water-lilies" into captivity began with Schomburgk. He removed living plants from inland lakes and bayous to Demerara, British Guiana, but they soon died. In 1840 Bridges obtained seed in the Bolivia locality, province of Moxos, and sent them in a jar of wet clay to England. Out of 22 seeds obtained at Kew, three germinated and grew vigorously as small seedlings until October, but died in December. In 1848 dry seeds were sent to England from the Essequibo river, along with rhizomes, the latter in Wardian cases; the rhizomes rotted, and the seeds refused to germinate. In 1849 an expedition from Demerara succeeded in bringing back to that town thirty-five living plants, but these all died. Finally some seeds were sent to Kew from British Guiana in bottles of fresh water by two English physicians, Rodie and Luckie. The first sending arrived Feb. 28, 1849, and on Nov. 8 a plant flowered at Chatsworth; the blossom was appropriately presented to Queen Victoria. From this stock *Victoria regia* was distributed to gardens in Europe, Asia and America. Van Houtte, of Ghent, first flowered it on the continent, and Caleb Cope, of Philadelphia, was the earliest successful cultivator in this country. His gardener was the late Thomas Meehan. The first flower opened Aug. 21, 1851.

The next notable importation of seed from South America was sent by Edward S. Rand, Jr., from Para, Brazil, to Mr. Sturtevant, then at Bordentown, N. J. The resulting plants proved to be slightly different from the former type, and were called *V. regia*, var. *Randii*. It is doubtless the same form that was described by Planchon as *V. Amazonica*, and retained with grave doubts by Caspary; subsequent cultivation has shown it not even varietally distinct from *V. regia* of British Guiana. In 1894, however, Mr. Tricker received seed of quite another species, which was provisionally named *V. regia*, var. *Trickeri;* it is much more amenable to out-of-door culture than the older type, and has received a well-deserved popularity. Specimens grown from seeds sent by Mr. Tricker to Kew were regarded simply as garden forms of *V. regia*, but recent investigation by Mr. Tricker and the writer shows that it is truly the *V. Cruziana* of d'Orbigny, dried specimens of which (including seeds) had been sent to Paris over 60 years before. Its far southern habitat (27° S.) explains its hardiness. The large starchy seeds of this species are used as food in Paraguay under the name of *Mais del Agua*, "water-corn." For much interesting information on Victoria, see Hooker, B.M. 4275–78; Planchon, in F.S. 6:193–224, etc.; Caspary in Flora Brasiliensis 4, part 2, p. 143 et seq. In 1854 John Fisk Allen published in Boston a quarto work (pages 21 x 27 in.) with colored plates, entitled: "Victoria regia; or the great water lily of America. With a brief account of its discovery and introduction into cultivation: with illustrations by William Sharp, from specimens grown at Salem, Massachusetts, U. S. A."

règia, Lindl. (including *V. règia*, var. *Rándii*). Fig. 2668. Lvs. sparingly pubescent beneath, upturned margins reddish, 3–8 in. high: fls. becoming dull crimson the second evening; sepals prickly almost or quite to the tips: prickles of the ovary about two-fifths in. (10–11 mm.) long: seed elliptic-globose, nearly ⅓ in. long, less in diam. (7–8 mm. long, 5½–6 mm. diam.); raphe indistinct; operculum elliptic-orbicular, with the micropyle at its center and hilum at the margin. British Guiana, Amazon and tributaries. B.M. 4275 (poor); 4276–78 (incorrect in some details). F.S. 6:595–602. Kerner, Natural History of Plants, pl. XI. Tricker, Water Garden pl. 1 and 2; p. 21, 35. Caspary, Fl. Brasil. 4, part 2, pl. 38, fig. 15 (seed).

Cruziàna, d Orbigny (known in cultivation as *V. règia*, var. *Trickeri*, and *V. Trickeri*). Lvs. densely villous beneath, upturned margins green, 6–8 in. high: fls. becoming deep red-pink the second evening; sepals prickly only at base, smooth above: prickles of ovary over ½ in. (15–16 mm.) long, crowded: seed subglobose, about ⅓ in. (7½–9 mm.) in diam.; raphe stout; operculum elongate-ovate, with hilum and micropyle equidistant from the margin. Parana river and tributaries, Paraguay. Tricker, Water Garden, pl. 1; pp. 51, 55. Caspary, Fl. Brasil. 4, part 2, pl. 38, fig. 16 (seed).—Introd. by Wm. Tricker in 1894.

HENRY S. CONARD.

Victoria regia at first was cultivated at a great expense in conservatories and tanks built especially for the purpose. Then it was grown in artificially heated ponds in the open air. The Victoria is largely grown in private and public gardens throughout the United States at the present time, together with tropical nymphæas, and in some cases without artificial heat, but this method of culture is uncertain and often unsatisfactory.

For many years but one type of Victoria was known, but in 1886 Mr. E. D. Sturtevant, of Bordentown, N. J., introduced another form that produced a deep crimson flower; it also possessed darker foliage and the upturned rim was deeper. It was known as *Victoria Randii*. Having grown this variety and the original for several seasons in the open air, the writer is unable to discern any difference, and two seasons ago he decided to drop *V. Randii*. In 1894 the undersigned received seed of what is now known to the trade as *V. Trickeri*. This is by far the best kind for out-of-door culture. Moreover, it can be grown where *V. regia* fails to grow, as it revels in a temperature of only 75°–80°.

Victoria regia is now considered of easy culture. Its requirements are heat, light and a rich, mellow loam in abundance. The seed should be sown during February and March. The temperature of the water should range between 85° to 90° F. The seed may be planted in pots or seed-pans and placed in shallow water. A tank 8–12 in. deep, having a metal lining, copper preferred, is very serviceable for seedlings and young plants. Where sufficient heat is not attained from the heating pipes, an addition can be made by the use of an oil-lamp. It is altogether unnecessary and unnatural to file or chip the seed to assist or hasten germination. The seedlings will appear in about twenty days, though occasionally a few may appear in ten days. These should be potted off singly into 2½-in. pots, using fine, loamy soil. The water temperature for the young plants should be the same as directed for the seed pots. As soon as the young plants acquire their first floating leaf they will doubtless be benefited by repotting. From the very beginning, as sprouted seeds, they should be kept steadily growing, repotting at intervals, until they are planted out in their summer quarters. As the young plants advance they will require more space, so that the leaves are not crowded and overlap each other.

To raise plants of *V. Trickeri* is altogether a different matter. The seed will not germinate in a high temperature; 65° to 70° is sufficient. The seed may be sown in February, but there is a great uncertainty as to how long one must wait for the seedlings to appear, and also as to what percentage of seeds will germinate. As soon as the seedlings appear they should be treated like seedlings of *V. regia*, except as to temperature, which should be kept as above stated for seedlings and small plants, and as the season advances may be raised to 75° and 80°. The rationality of the cool treatment here advocated is borne out by the fact that early in June quantities of seedlings appear in the pond in the open where a plant has grown the preceding season, the seed having remained in the pond during the winter. Planting in summer quarters may be done early in June or whenever it is safe to plant out tender nymphæas, that is, when the pond is not artificially heated. Where it is desired to plant out in unheated ponds it is not safe to plant before the middle or latter end of June. The conditions of the weather, earliness or lateness of the season, locality, etc., must all be taken into account.

The best results are to be obtained from an artificially heated pond, or pits in the pond specially constructed to start the Victorias, these pits to be heated by hot water or steam and covered with frames and sashes. By this method plants may be set in their summer quarters early in May and heat applied until the middle of June, or rather a temperature of 85° maintained until the advent of summer weather.

Very gratifying results are obtained when the Victoria is grown under glass, as it is thus grown in several places in the United States, notably at Schenley Park, Pittsburg, and Allegheny Park; also at "Greystone," the estate of Samuel Untermyer, Esq., Yonkers, N. Y.; also at many notable gardens in Europe. Plants grown under glass usually attain to larger dimensions, as they are protected against climatic changes and the elements, besides enjoying more of a tropical atmosphere. There is, however, more than one disadvantage.

Setting aside the costly construction, labor, etc., it is by no means inviting even on a warm day to spend many minutes in such a structure. Compare this with a natural pond and its surroundings and a cool shady seat where these gorgeous plants may be viewed at leisure.

Whether grown indoors or out, these plants are only annuals, and seedlings are of necessity raised every spring. They form no tubers as do the tender nymphæas, or rootstock as do the hardy nymphæas.

Few, if any, insects are troublesome on these plants. The worst is the black fly or aphis. The use of insecticides should not be resorted to, as they are most likely to damage the foliage. The safest remedy is to introduce a colony or two of the well-known "lady bug." They and their larvæ will soon clear off all the aphides without any injury to the plant. Wm. Tricker.

VÍGNA (Dominic Vigni, Paduan commentator on Theophrastus in the seventeenth century) is a leguminous genus of 30 or more species, closely allied to Phaseolus. It is distinguished under *Cowpea* in Vol. I. The Cowpea is known both as **V. Cátjang**, Walpers, and *V. Sinénsis*, Endlicher. The former name, however, dates from 1839 and the latter from 1848, and the former should be used. The Cowpea is an annual bean-like rambling vine with three rhomboid-ovate stalked leaflets, the lateral ones unequal-sided, the petioles long. The flowers are bean-like white or pale, borne two or three together on the summit of a long axillary peduncle. The pods are slender, usually curved, a few inches to a foot or more long. Seeds small, kidney-shaped, bean-like, white or dark, usually with a different color about the eye. The Cowpea varies much in stature, and particularly in the color of the bean. It is possible that more than one species is concerned in these horticultural forms.

The nomenclature of the cultivated varieties of Cowpeas is almost hopelessly confused. Formerly the name Cowpea was restricted to the buff-colored or clay pea, but now it is commonly used generically. The word Cowpea is an Americanism. Common generic terms now in use in the South are "black-eye pea" and "cornfield pea."

While the Cowpea is now used mostly for animal food and green-manuring, the pea itself is also a good human food and has been so used for many years. For table use the peas are usually gathered when the pods begin to change color, although the dried peas are also extensively used. As long ago as 1855 an excellent essay on Cowpeas was written by Edmund Ruffin (Essays and Notes on Agriculture, Richmond, 1855). L. H. B.

VIGUIÈRA (Dr. A. Viguier, botanist of Montpellier, France). *Compósitæ.* About 60 species of herbaceous or somewhat shrubby plants, found in the warmer parts of the world, especially America. The following is a native of Lower Calif. and is offered in S. Calif. It is a tall, bushy plant with silvery foliage and small yellow fls. like single sunflowers, but borne in ample corymbs. The plant blooms both winter and summer. For generic characters see Gray's Synoptical Flora or Bot. Calif.

tomentósa, Gray. Shrub or branching subshrub: lvs. opposite, subcordate, serrate, tomentose on both sides, 3–5 in. long: heads corymbose: akenes villous, with 2 long awns and many small scales. W. M.

VILLAGE IMPROVEMENT AND CIVIC IMPROVEMENT. An improvement association is an organization of persons who band themselves together in order to promote the civic beauty and hygiene of the town wherein they live. Such associations have no legislative power outside their own bodies, yet they may rightfully use their influence to promote laws affecting the general welfare. The secret of their success in the long run is in educating public opinion to demand good officials, and then in coöperating with the officials, not antagonizing them. A few notable associations are composed entirely of women. Those of Honesdale, Pa., and Petaluma, Cal., are good examples. Other associations equally noted are composed of both sexes, Bar Harbor, Me., and Stockbridge, Mass., having examples of the best type of mixed associations. The Merchants Association of San Francisco, with a membership of more than a thousand, is an excellent example of an effective society composed wholly of men. Experience has taught the older organizations that a juvenile auxiliary is a valuable adjunct. These juvenile branches are worked through the public schools, and their promotion is the most practical way known of teaching civics.

These associations are organized by one or more interested persons calling a meeting and electing officers. The officers are president, vice-president, recording and corresponding secretaries, a treasurer, and an executive committee, all elected annually. The duty of the last is to plan the work, make the contracts and expend the funds. The funds are raised by annual dues of the membership, by contributions and by entertainments.

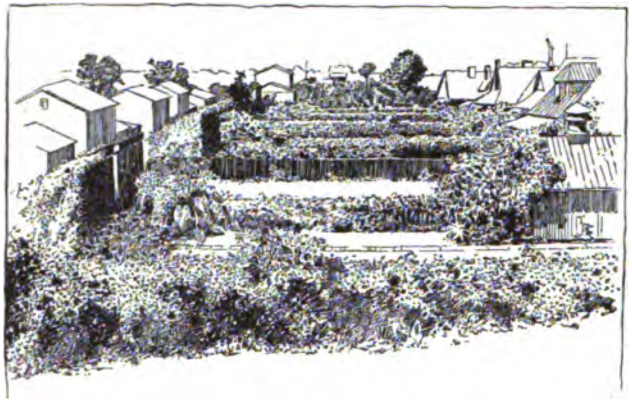
2669. Glimpse of a village street in a community where the idea of village improvement flourishes, showing that a central lawn with border planting is adapted even to small areas.

The usual and most successful mode of work done by these associations is to form as many committees as are desired, and place every member of the association on one of these committees. Each committee has a chairman, who calls its meetings independent of any meetings of the central body. This placing of each member upon a committee assures the working interest of the entire membership.

In large cities it has been found best to have section or ward organizations, which work for the especial needs of their ward or section, while delegates from these sections are elected to the central body, which works for the general good of the whole city. Denver, Col., Oakland and San Francisco, Cal., and the famous Woman's Civic Club of St. Paul, Minn., work upon these lines. The standing committees are never quite alike in any two associations. They necessarily vary with the needs of the community.

While the avowed object of these associations is the improvement and ornamentation of public streets and highways, the cleaning and beautifying of premises, school yards, library grounds, railway stations, and other public buildings, the formation of parks and the preservation of natural beauties, yet in an association of progressive, broad-minded people, much kindred work naturally creeps in. For example, the Montclair, N. J., association has ten standing committees and constitutional power to add special committees as need arises. The names of these committees are as follows: street, sanitary, finance, humane, railroad, children's auxiliary, park, preservation of natural beauties, prevention of cruelty to children, prevention of cruelty to animals.

The work of committees may be well set forth by specific examples from the Montclair society. Under the supervision of the *street committee*, galvanized iron barrels were placed at intervals along the main thoroughfares for the reception of rubbish, such as paper, and fruit rinds. Shopkeepers are asked to keep their premises in good order. If they do not comply with the request, the Town Improvement Association sends a man with a wheelbarrow (the latter labeled T. I. A.), and with broom and hoe a general housecleaning takes place. After two or three visits of the T. I. A. man, the proprietor generally takes the hint and attends to his premises himself. The *sanitary committee* reports to the health board any nuisance. The milk supply has been carefully looked after, the dairies inspected, and a map showing the locations of all the dairies placed on file in the office of the town clerk, where it may be seen by any householder who cares to examine it. The *finance committee* looks after the funds. Annual dues are fifty cents a member. The work of the *humane committee* is to inspect the police station, see that it is kept in sanitary condition, and the prisoners properly treated. The *railroad committee* keeps a watchful eye upon the stations and sees that they are as neat as possible and the surroundings made attractive. The *children's auxiliary* is formed of eleven hundred school children, who have pledged themselves to "work together to make Montclair a happier place in which to live, by doing everything we can to make the town more healthful and beautiful." The different classes from the school take charge of the flower-beds around the buildings, attend to the planting and keep them in order. All this fosters early the love of attractive surroundings, engenders habits of neatness, and develops local pride and patriotism.



2670. A vista of improved backyards in Dayton, Ohio.

The committee for the preservation of natural beauties has much to keep it busy. Its members watch the fine trees of the town, and if any are splitting, the owners are notified to mend them. Dead trees are cut down, and the owners of unsightly fences are requested to remove them. The burning of hedge-rows is forbidden, as it destroys the wild flowers and leads to forest fires. The duties of the committees for prevention of cruelty to children and animals are self-explanatory. They are auxiliary to the state association, and have full power to act. The *park committee* takes charge of any waste pieces of ground, generally at the intersection of roads, keeps them in order, and plants shrubbery or makes flower-beds, as the case may be.

Montclair boasts of the most humanely equipped jail in the state, with a separate apartment for women, and a sanitary and padded cell for the insane. The committee for the prevention of cruelty to animals has placed the sign posts, "Please uncheck your horses going up this hill," at the top and bottom of the mountain road. The paving of the plaza in front of the railway station is due to the efforts of the railway committee, which visited the officials at least once a month for three years before the work was undertaken.

Newton Center and Stockbridge, Mass., contend for the honor of forming the first improvement association. Newton Center's association claims to be older by a year than the Laurel Hill Association of Stockbridge. The latter organization was founded in 1853 through the efforts of Miss Mary Gross Hopkins, afterwards Mrs. J. Z. Goodrich, and was caused by overhearing the caustic comments of a summer visitor upon the untidy, unhygienic condition of the village and its undesirability from these causes as a summer residence. Miss Hopkins reported the visitor's remarks to her townspeople, and after a year's agitation the Laurel Hill Association of Stockbridge was formed. The first year $1,000 was raised, 400 shade trees planted, the village green put in order and prizes offered for the longest and best strip of sidewalk. The offer of these prizes, together with a reward for the detection and punishment of any one caught destroying any of these improvements, had such a marvelous effect in arousing civic pride in the appearance of the village that interest in the association has never failed. The beauty of the village had much to do with the selection of the famous Lenox neighborhood, part of which pays taxes in Stockbridge. So pleased were the townspeople and summer visitors with the work of the association that it became necessary to obtain a state charter before the association could legally inherit the funds, parks and other gifts to the value of more than one hundred thousand dollars left in its charge.

Bar Harbor, Maine, regards its improvement association in the light of a commercial investment. The summer visitors demand that the village be kept clean and pretty, and they give liberally to the association. This association makes paths over the island and keeps them in repair. It also keeps patrols on these paths in summer to put out camp-fires, well knowing that if the forests are destroyed the charm of the island would be greatly lessened.

The value of an improvement society's work as a commercial investment is clearly perceived by Europeans. The Schwarzwald Improvement Society of Germany numbers 3,500 members, who are assessed an annual due of $1.25. This association was formed for the purpose of "making the Black Forest known and accessible to the public, of preserving and protecting ruins, of improving pleasure-grounds, erecting pavilions, towers, etc., and generally promoting intercourse." There are thirty-nine sections in this immense association, each section working for its own interest after the manner of the American ward associations. Both the German and English associations work to attract capital to their towns. River-sides are made into a continuous parkway through the town, paths are opened to points where beautiful views may be had, and cards in the hotels and public buildings draw visitors' attention to these matters, and to the fact that comfortable seats will be found in these places. German children are urged to be polite to strangers, and in London the public schools have organized a League of Courtesy. English laws do not permit the pollution of streams by sewage or factory waste, and in Europe good roads and clean streets have for so long been a national and municipal concern that they are looked upon as a matter of course. In general, European associations are not obliged to consider these problems, but are free to turn their attention to the promotion of civic beauty in all its various forms.

It is the leading men and women of each country who are promoting these associations. The society called Scapa, the mission of which is the checking of the abuse of public advertising, has more than one thousand members enrolled, some of them members of Parliament. The work of this notable society has attracted the favorable attention of almost every government in Europe.

In America, the "National League of Improvement Associations" was organized at Springfield, Ohio, Oct. 10, 1900. It is now known as the "American League for

Civic Improvement." The object of the organization, as stated in the constitution, "shall be to bring into communication for acquaintance and mutual helpfulness all organizations interested in the promotion of outdoor art, public beauty, town, village and neighborhood improvement." The headquarters of the national organization are at Springfield, Ohio.

As in Europe, the commercial possibilities of the work are beginning to appeal to the American business man. Large owners of real estate and tenant houses are adopting as business methods some of the special features of improvement associations. Commercial clubs and boards of trade are awakening to the fact that a cleanly and beautiful city containing fine boulevards, riverside drives and parks, public baths and swimming pools, is as much of an inducement to new firms desiring to locate as is a cash bonus or good shipping facilities. Firms and good citizens seeking new locations and finding these advantages are assured without further search that the schools will be good, the residence district fine, and that a minimum of undesirable residents will be found. Nurserymen, florists and dealers in paint are the first to reap material benefit from the formation of these associations. Usually the first step in improving property is the planting of trees and flowers, then the house receives a coat of paint. It is an excellent idea for an improvement association to encourage floral shows, with prizes to schools and school children, for through the latter medium the infection of beautifying is carried into homes that can be reached no other way.

These associations in no way interfere with the work of the city officers. Rather they supplement it by doing the things for which the town laws make no provision. The officers of towns having one or more of these associations find the enforcement of laws made easier, and should a large sum be needed for necessary improvements, they are likely to find an intelligent public knowledge upon the subject in place of the oftentimes exasperating stupidity.

The results obtained from an active and prosperous association are manifold. These societies make far better citizenship: they create an intelligent civic pride. They make possible practical civics in the public schools. The commercial benefits of such work appeal to the liberal and progressive element among all business men.

Jessie M. Good.

The limitations of space do not allow an historical sketch of the various movements culminating in the organization of the American League for Civic Improvement, nor a list of the various periodicals which are devoted partly or wholly to the work. A great work for village and civic improvement is done by general agencies as well as by the special societies devoted to the work. An analysis of these complex social forces is beyond the scope of this cyclopedia, but the following outline sent by Charles Mulford Robinson, author of "The Basis of Civic Improvement," will be found very suggestive. The work outside the special societies may be roughly summarized as that done.—I. By committees (1) Of women's clubs (*a*) local, (*b*) federated; (2) Of boards of trade, etc.; (3) Of real estate exchanges. II. By political organizations, in securing better officials. III. By the organizations of these officials, (1) The American Society of Municipal Improvements, (2) The League of American Municipalities, (3) The State Leagues of Municipalities. IV. By corporations, (1) Model communities, (2) Improvement of home grounds, neighborhoods. V. By individuals (1) For private profit, (2) Out of public spirit.

L. H. B.

VILLÁRSIA nymphoides is the plant described at p. 925 of this work as *Limnanthemum nymphoides*. The plant is probably to be referred to *Limnanthemum peltatum*, however. To the list of pictures add Gn. 48:1036 and 48, p. 300.

VIMINÀRIA (Latin, *vimen*, a slender twig or withe, alluding to the branches). *Leguminòsæ*. A single species, an Australian shrub with rush-like stems and long, wiry "leafless" branches, i.e., the leaves for the most part reduced to long, filiform petioles, although at the ends of the more vigorous or lower branches a few oval or lanceolate lvs. are often found. The rather small flowers are pea-shaped, orange-yellow and are produced in long, terminal racemes. Calyx-teeth short; petals on rather long claws; standard roundish; wings oblong, shorter than the standard; keel slightly curved, as long as the wings; stamens free: ovary nearly sessile; style filiform: pod ovoid-oblong, usually indehiscent: seeds 1–2.

denudàta, Smith. The name Leafless Rush-broom has been proposed for this. Leafless yellow-fld. shrub, attaining 10–20 ft., formerly cult. in European greenhouses as a small tender shrub: lvs. 3–8 in. long: pod 2–3 lines long. Australia. B.M. 1190. P.M. 14:123.—Offered in S. Calif.

F. W. Barclay.

VÍNCA (*pervinca*, old Latin name of Periwinkle, used by Pliny). *Apocynàceæ*. A genus of 10 species including the common Periwinkle or Trailing Myrtle, *Vinca minor*. This is one of the commonest and best plants for covering the ground in deep shade, especially under trees and in cemeteries. It is a hardy trailing plant with shining evergreen foliage and blue, salver-shaped, 5-lobed fls. about an inch across, appearing in spring or early summer. It forms a dense carpet to the exclusion of other herbs. It thrives best in moist, half-shaded positions, but will grow in the deepest shade even in poor soil, especially if it be stony. It is a capital plant for clothing steep banks, covering rocks and carpeting groves. It can be planted successfully on a large scale any time from spring to fall during mild or rainy weather. It is propagated by division or by cuttings, as seeds very rarely mature. The Periwinkle will live in city yards under trees where grass will not thrive. *V. minor* is the commonest and perhaps most variable species. Varieties with white, purple and double fls. are kept in most nurseries, as also a form with variegated foliage.

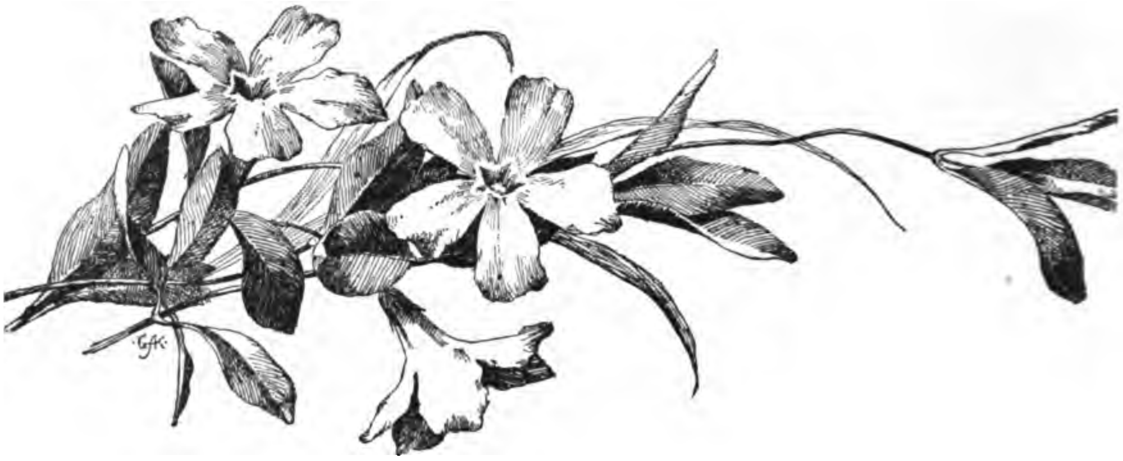
Vinca major is larger in all its parts than the common Periwinkle and not so hardy. It is well known to florists. A variegated form of it is seen in nearly every veranda box in the country.

V. rosea is a tender plant of erect habit which is used chiefly for summer bedding. It grows about a foot high and has rosy purple or white fls. with or without a reddish eye, and often 2 in. across. The plants bloom continuously from the time they are set out until frost. It can be grown in large masses for public parks with somewhat less expense than geraniums. Mr. Stromback, head gardener of Lincoln Park, Chicago, has recorded his experience with *Vinca rosea* in Florists' Review 1:141 as follows: The seed is sown in Jan. or Feb. in flats of sandy soil in a temp. of 65°–70°. When the seedlings show the second leaf, they are pricked out about an inch apart in trays of the same soil, and when the little plants have 5 or 6 lvs. they are potted into 2-in. rose pots, and later shifted to 3-in. pots. The majority are bedded out from the 3-in. pots. The soil of the bed should be a sandy loam if possible, and the plants will not do well in a very heavy soil. In bedding, set the plants about a foot apart. They require more water than a geranium, and when the bed is watered it should be given a good soaking and then left alone for a few days. The plants require no trimming.

The amateur will find *Vinca rosea* a satisfactory window plant that can be grown with little trouble from seeds started as late as April, but of course such plants will not bloom as early as the bedding stock propagated in Jan. or Feb. *V. rosea* is the largest flowered Vinca, and it seeds freely.

W. M.

Vinca major and varieties are the most useful of the genus to the commercial florist. Some plants from 2-inch or 3-inch pots should be planted out in May. They will make large plants by September. For decorating purposes, some of these plants can be lifted and put in 5-inch pots and will winter in a very cool house. To obtain useful sized plants in 3-inch pots the following spring for veranda, box and vases, cuttings should be put into sand end of September. The long trailing growths will give an abundance of material. Always make the cutting with two eyes, choosing neither the hard growth at base nor the very soft tips. They root slowly but surely in about a month, and until February will do very well in a 2½-inch pot. About the middle of February shake off the soil and give them a 3-inch pot, and they will make a fine growth bv middle of May. In growing these trailing Vincas in pots the principal point to observe is never to let them want for water.


2671. Vinca minor, the Common Periwinkle, or Running Myrtle. Natural size.

William Scott.

Vinca is a genus of herbs or subshrubs, erect or procumbent: lvs. opposite: fls. rather large, axillary, solitary; corolla salver-shaped, with a narrow throat which is pilose inside or thickened-calloused; stamens included above the middle of the tube; carpels 2, distinct; stigma annular, thick, viscid; ovules 6–many in each carpel, in 2 series: follicles 2, erect or divergent. The genus may be divided into 2 sections: 1. *Pervinca*, in which the anther-cells are short and divided by a wide connective; 2. *Lochnera*, in which the anther-cells are normal. *V. rosea* belongs to Section 2; the others mentioned below are included in Section 1.

INDEX.

alba, 1, 4.
argentea, 1.
atropurpurea, 1.
aurea, 2.
Bride, The, 1.
cærulea, 1.
elegantissima, 1, 2.
herbacea, 3.
major, 2.
minor, 1.
oculata, 4.
plena, 1.
purpurea, 1.
reticulata, 2.
rosea, 4.
variegata, 2.
varius, 4.

A. *Trailing herbs, hardy or nearly so, only the short flowering stems ascending: fls. produced in spring or early summer, mostly blue or white. European species.*

B. *Foliage evergreen.*

C. *Lvs. ovate or oblong-ovate: corolla-lobes wedge-shaped: calyx glabrous.*

1. **minor**, Linn. Common Periwinkle. Blue, Running or Trailing Myrtle. Fig. 2671. Hardy evergreen trailing herb, in all country gardens and running wild in cemeteries and shady places, the blue-fld. or typical form being commonest. Often called "Myrtle" but the classic myrtle is *Myrtus communis*. Very rarely produces seed, but spreads freely by creeping sterile stems which root at every joint. Lvs. ovate or oblong-ovate, glabrous and shining, barely 1½ in. long: petiole very short, with 2 glands near the apex: calyx-lobes lanceolate, glabrous; corolla-lobes wedge-shaped, obtusely truncate. Eu.

The following horticultural varieties are advertised in America: Var. **álba**, with single white fls.; **alba plèna**, with double white fls.; **alba variegàta**, with single white fls. and variegated foliage; **argentea variegàta**, with silvery variegation; **atropurpùrea compácta**, with single dark purple fls.; **aurea variegàta**, with golden variegation; **cærùlea**, with single blue fls.; **plèna**, with double blue fls.; **ròsea**, with single rosy fls.; **purpurea plèna**, with purple double fls. Gn. 50:1078. Some of these are advertised without reference to *V. minor*, as if they were good species, thus *V. cærulea* and *purpurea*. *V. elegantissima alba* belongs here, also "The Bride," a white variety with a pink center.

CC. *Lvs. subcordate-ovate: corolla-lobes obovate: calyx ciliate.*

2. **màjor**, Linn. Larger Periwinkle. Larger in all its parts than *V. minor*, not quite hardy north, and rooting only at the tips of the sterile stems. Lvs. broader below the middle than in *V. minor*, subcordate-ovate, often 2–3 in. long, ciliate; petiole with 2 glands near the apex: fls. blue; calyx-lobes narrowly linear, ciliate; corolla-lobes obovate. Eu.—This species is much subject to mealy bug. The variegated forms are popular for veranda boxes and hanging baskets. Some are blotched with yellow, others are margined. Here seem to belong *V. aurea marginata* and *V. aurea maculata*, Hort. *V. major*, vars. **variegàta** and **reticulàta**, are also advertised. Var. **elegantissima**, Hort., is a handsome form with lvs. bordered and blotched with yellowish white. It seems to be common with the florists, although it is rarely, if ever, advertised in American trade catalogues. It is one of the best forms for vases for baskets and for decoration indoors. The sprays should be allowed to grow long, in order to develop their characteristics. Cuttings should be struck early in the fall and if kept growing steadily will make satisfactory specimens in five-inch pots. It is a good idea to plant this variety in the front part of a sunny greenhouse bench where the long sprays may reach down to the walk. As a window-box plant it has the merit of withstanding considerable neglect.

2672. Vinca rosea. (× nearly ½).

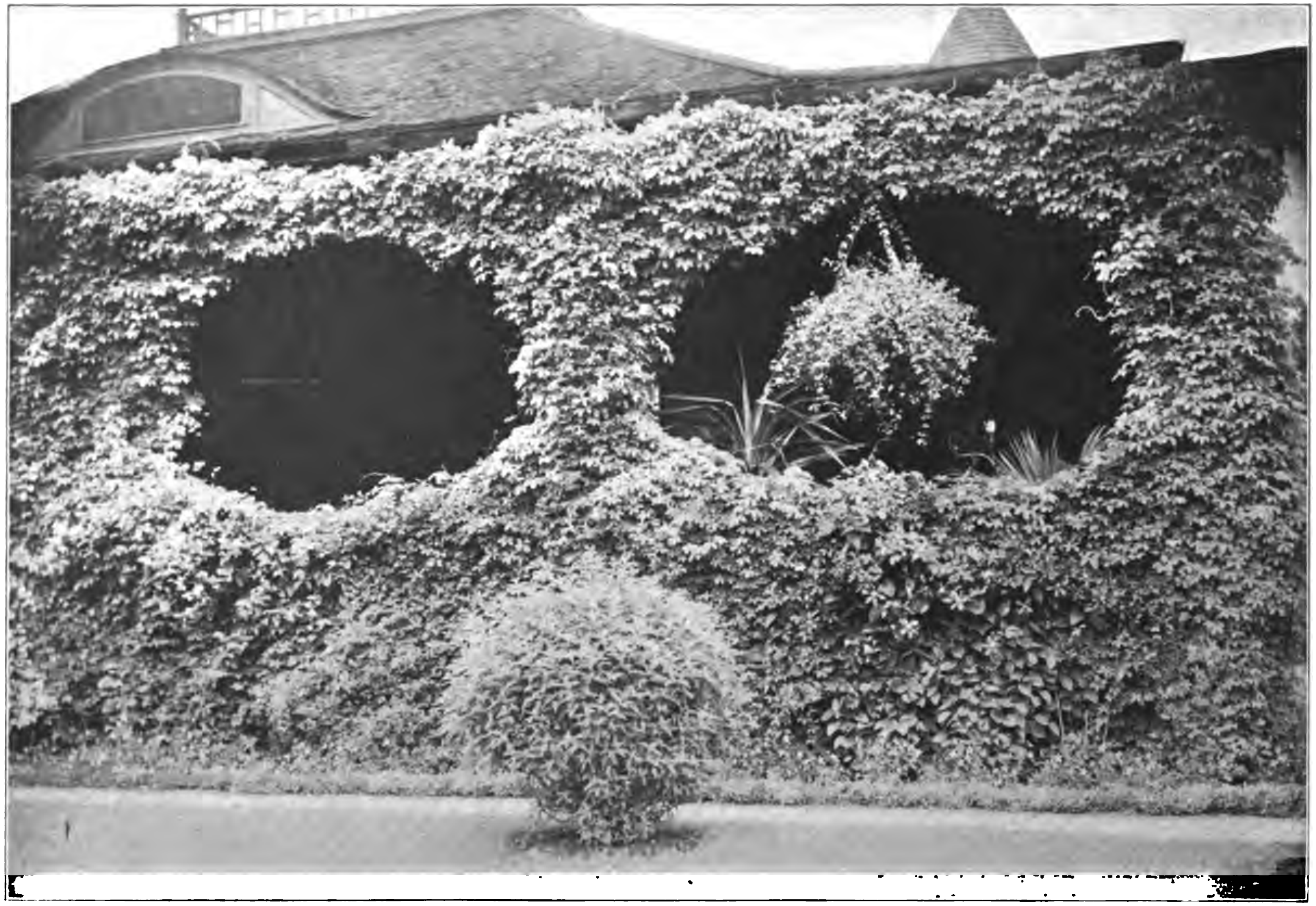


Plate XLVII. Vines.

Akebia quinata on a porch. Lantana in the basket. A bush of Caryopteris Mastacanthus in the foreground.

BB. *Foliage deciduous, or less evergreen.*

3. **herbàcea,** Waldst. & Kit. HERBACEOUS PERIWINKLE. Hardy trailing herb, which generally loses its foliage in winter, sends up short flowering stems in spring, followed by sterile creeping stems which root at the tips. The fls. are purpler than in the common Periwinkle, later, and the corolla-lobes are narrower: lvs. elliptical or lanceolate, margin revolute, ciliate; petiole with 2 glands near the middle: calyx-lobes narrowly lanceolate, ciliolate; corolla-lobes oblong-obovate, dimidiate. Eastern Eu., Asia Minor. B.M. 2002. B.R. 4:301.

AA. *Tender, erect subshrub (herb N.), with rosy or white fls. produced all summer.*

4. **ròsea,** Linn. MADAGASCAR PERIWINKLE. Fig. 2672. Tender, erect, everblooming plant, somewhat shrubby at the base, cosmopolitan in the tropics: lvs. oblong, narrowed at base, veiny: petiole glandular at the base. fls. with a very small orifice, rosy purple or white, the latter with or without a reddish eye; calyx-lobes linear, corolla-lobes dimidiate-obovate, mucronulate. Gn. 36, p. 455; 43, p. 389. V. 13:49; 16:49. B.M. 248. F.R. 1:141.—This is commonly called the "Madagascar Periwinkle," but *V. rosea* is probably not native to the Old World, while the only species of Vinca that is really native to Madagascar, viz., *V. lancea*, is not in cultivation. The plant is sometimes called "Cape Periwinkle" and "Old Maid." The three main types should be known as *V. rosea*, *V. rosea*, var. *alba*, and *V. rosea*, var. *oculata*, the latter being a white flower with pink or red center. As a matter of fact, these appear in American catalogues as *V. alba*, *V. alba pura*, *V. alba nova*, *V. oculata* and *V. varius*, the latter being a trade name for seed of mixed varieties.

W. M.

VINCETÓXICUM. The Mosquito Plant or Cruel Plant, known in the trade as *Vincetoxicum acuminatum* and *V. Japonicum*, is *Cynanchum acuminatifolium*, which see.

VINE-CACTUS. *Fouquieria splendens.*

VINE, GLORY. *Clianthus.*

VINE PEACH. See under *Cucumis Melo.*

VINE, PIPE. *Aristolochia Sipho.*

VINE, SILK. See *Periploca Græca.*

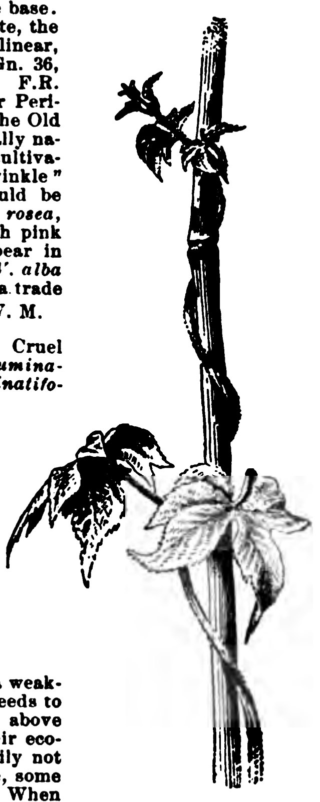
VINE, WONGA WONGA. *Tecoma australis.*

VINES. In horticultural parlance, a vine is a weak-stemmed, more or less tall-growing plant that needs to have the support of some rigid object to hold it above the earth. Many plants that are grown for their economic uses are vines, although they are ordinarily not so classified in horticultural works; for example, some of the beans, the hop and the sweet potato plant. When vines are mentioned in horticultural writings, plants that are used for ornament are commonly understood. In general literature the term "vine," when used specifically, designates the grape. Sometimes vegetable-gardeners, when speaking of vines, mean cucurbitaceous plants, as melons, cucumbers and squashes.

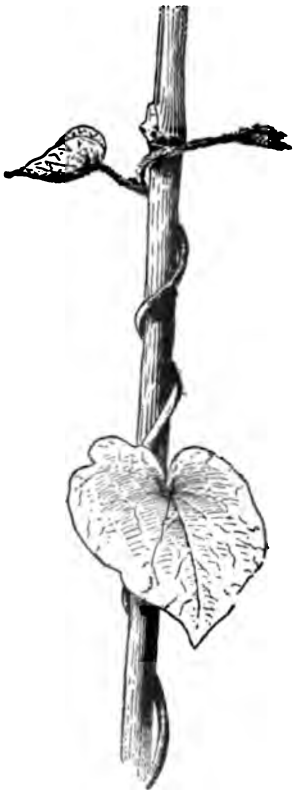
Vines belong to many natural orders and represent very many types of plant beauty. The larger part of them are useful in horticultural operations as screens for covering unsightly objects or for shading verandas and summer houses. Many of them are shrubs, the plant body being woody and persisting year after year; others are perennial herbs, dying to the ground but the root persisting from year to year, as some dioscoreas; others are true annual herbs, as morning-glories. Some of them are valued chiefly for foliage, as the Virginia creeper, Japanese ivy, grapes and the true or English ivy; others are prized largely for their flowers, as morning-glories, moonflowers and scarlet runners. Vines represent all degrees of hardiness or tenderness; they are also of various heights and differ in rapidity of growth; therefore it is impossible to make a list of vines that shall apply to the whole country.

Vines are really climbing plants. They get up in the world in three general ways: by scrambling or clambering over other plants without any special devices for aiding them in the ascent; by twining about the support; by ascending by means of special organs, as roots or tendrils. The larger number of cultivated climbing plants belong to the last two categories. However, there are many useful climbers amongst the scramblers, as, for example, some of the long-stemmed roses. These plants usually have to be tied to a support unless they are allowed to ramble at will over some expanded surface, as the top of a bush or a broad stone wall.

Each species of twining plant has its own direction of winding about the support, and the species follows this direction under all ordinary circumstances. Some of them, as the hops, wind about the support in the direction of the movement of the sun, or from the observer's right to his left. Fig. 2673. Others, as the morning glory, twine in a direction opposed to the daily movement of the sun, or from the observer's left to his right. Fig. 2674. The constancy of these directions of climbing was observed long ago. It is interesting to know that Paul Dudley, Chief Justice of Massachusetts, made this observation as long ago as 1724 and reported it to the Royal Philosophical Society. A full discussion of this and related topics concerning climbing plants may be found in Darwin's book, "The Movements and Habits of Climbing Plants."

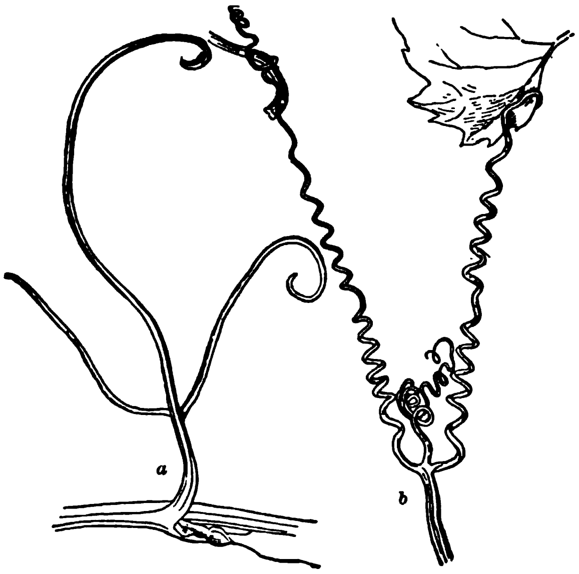


2673. Hop (Humulus Japonicus), twining from the observer's right to his left, or with the sun.



2674. Morning-glory, twining from the observer's left to his right, or against the sun.

The special organs by means of which plants climb are of many kinds. In general they may be referred to three general categories: roots, as the trumpet creeper and ivies; coiling petioles or leaf-stalks, as the clematis (Fig. 487) and the nasturtium; tendrils. The tendrils are of various morphological origin. Some of them, as of the grape, are modified branches or stems; others, as those of the pea and cobæa, are modified leaflets; still others, as in some species of lathyrus, are modified stipules. True tendrils are always definitely arranged with reference to the position of the leaves. The young extended tendril usually swings about in a circle or ellipse, its end being somewhat bent or coiled. When this end strikes a support it fastens itself securely, and then the plant is drawn to the support or held to it by the coiling of the tendril. This coil also serves as a spring whereby the plant is held to its support during winds. The continuous coiling of the tendril in one direction would twist the tendril in two; therefore, tendrils usually coil in more than one direction, one part of the length being coiled from right to left and another part from left to right. Some of these phenomena may be seen in Fig. 2675, which represents the tendrils of one of the Cucurbitaceæ. All members of this family, as cucumbers, melons, pumpkins and wild balsam apple, are excellent subjects on which to observe these phenomena.



2675. The coiling of tendrils; *a* shows the tendril hooks ready to grasp a support; *b*, shows the coiling of the tendril-branches and the straight or not-coiled spaces where the direction of the coil is reversed. Cassabanana (Sicana).

Of the very many vines that may be used with good results in the open air in the North the following are common and therefore to be commended. Many greenhouse vines can also be used in the open during the summer, but these are not included in the present list.

AA. *Top shrubby.*

Ampelopsis quinquefolia, Virginia creeper. Figs. 80, 1866. The best single vine for covering buildings and arbors, since it is perfectly hardy and thrives under many conditions. Plants should be selected from vines of known habit, as some individuals cling much better than others.

Ampelopsis tricuspidata (*A. Veitchi*). Fig. 2676; also Fig. 81, Vol. I. A neater and handsomer vine than the Virginia creeper, clinging closer, but it is often injured by winter in exposed places, especially when young. It is best adapted to stone and brick buildings.

Clematis of various species. *C. paniculata* and *C. Virginiana* are best for general use.

Tecoma radicans, trumpet creeper.

Vitis or grapes of various species. The wild species are preferable. Fig. 2677.

Hedera Helix, true ivy. Fig. 1023. The English ivy does not endure the bright sun of northern winters. Hardy in middle states, and often does well on the north side of buildings farther north.

Actinidia arguta. Fig. 29. One of the best arbor vines.

Akebia quinata. Figs. 56, 57. Graceful and pretty.

Lonicera sempervirens, *L. flava* and other honeysuckles. *L. Japonica* (or *L. Halliana*) is half evergreen in the North and is popular.

Aristolochia macrophylla, Dutchman's pipe. Figs. 138–140. A robust grower, with enormous leaves. Useful for covering verandas and arbors.

Celastrus scandens, waxwork or false bittersweet.

Wistaria Sinensis and *W. speciosa*. Figs. 2475, 2476.

AA. *Top dying to the ground, or nearly so, in winter. Some are annuals.*

Menispermum Canadense, moonseed. A small but attractive native twiner useful for wild gardens.

Humulus Lupulus and *H. Japonicus*. The former is the common perennial hop; the latter is a sturdy and useful annual.

Dioscorea divaricata, yam, Chinese potato, cinnamon vine. The large, deep-seated tuberous roots withstand freezing. Climbs high, but does not produce foliage enough to cover unsightly objects. *Dioscorea villosa* is a small but handsome native species.

Pueraria Thunbergiana (known also as *Dolichos Japonicus*), while not yet common, deserves to be better known. It is an herbaceous perennial in the North, but makes a woody top in the South. Very vigorous grower.

Phaseolus multiflorus, scarlet runner bean, Dutch case-knife bean. Red- and white-fld. varieties. Perennial in the South. Tender.

Ipomœa, various species. Moonflowers and morning-glories belong here. Some are perennials far south; all useful and interesting. Tender.

Tropæolum majus, nasturtium. Tender annual.

T. peregrinum, canary-bird flower. Tender annual.

Lathyrus odoratus, sweet pea. Hardy annual.

Thunbergia alata. Tender annual.

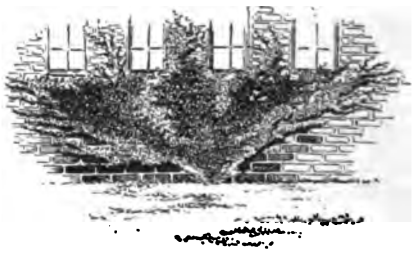
Dolichos Lablab, hyacinth bean. Tender annual.

Cardiospermum Halicacabum, balloon vine. Tender annual.

Adlumia cirrhosa, Allegheny vine. Tender perennial.

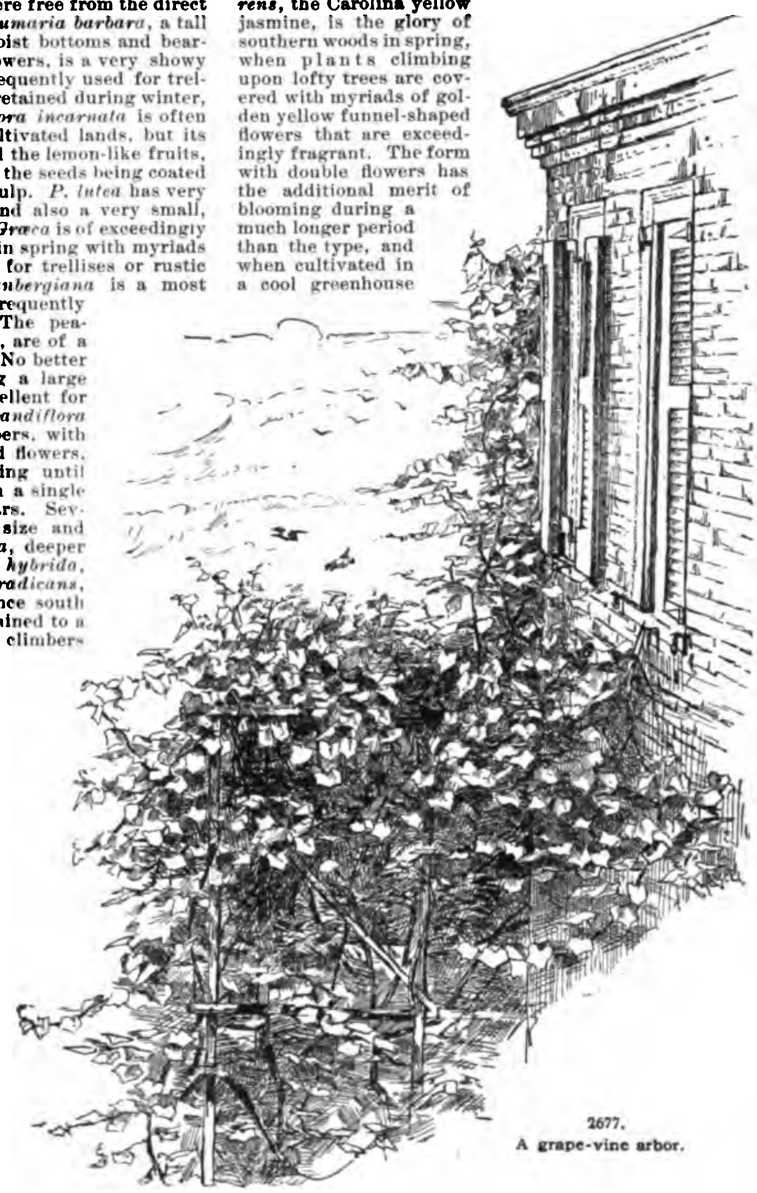
Cobæa scandens. Tender. L. H. B.

Vines for the South. I. DECIDUOUS. *Ampelopsis tricuspidata* and *quinquefolia* are exceedingly popular for covering brick walls, stumps, or dead trees. Being deciduous, they are free from the objection of evergreen ivies, whose foliage often accumulates dust and is a harbor for sparrows' nests. *A. arborea* retains its black berries all winter; the form with variegated foliage is most desirable.—*Berchemia scandens* has small, greenish flowers; not showy, but of rapid growth in moist soil.—*Celastrus scandens* is desirable for its orange-colored capsules and scarlet seeds, which are retained during a part of the winter.—*Centrosema Virginianum*, a twining herb, is a very desirable small vine. The large, pea-shaped lavender flowers are produced from May until autumn.—*Clematis*. The best native species are *C. crispa*, with dark bluish purple campanulate flowers, *C. coccinea* with scarlet campanulate flowers, and *C. holosericea*, conspicuous for the silky plumose tails of the akenes. All these are herbaceous and lose their stems during winter. Of the hybrid garden varieties



2676. Ampelopsis tricuspidata on a stone building.

which retain their stems there are only a few that can stand the long, dry summers of the middle South. The most resistant are *C. Jackmani*, Fairy Queen, *Henryi*, *lanuginosa*, Otto Frœbel. Duchess of Edinburgh, *velutina*,but all should be planted where free from the direct glare of the afternoon sun.—*Decumaria barbara*, a tall climber usually found in rich moist bottoms and bearing numerous fragrant white flowers, is a very showy plant.—*Lycium Barbarum* is frequently used for trellises; the red berries, which are retained during winter, are its main attraction.—*Passiflora incarnata* is often a troublesome weed in newly cultivated lands, but its flowers are remarkably showy and the lemon-like fruits, called may-pops south, are edible, the seeds being coated with a mucilaginous acidulated pulp. *P. lutea* has very small greenish yellow flowers and also a very small, purple-colored fruit.—*Periploca Græca* is of exceedingly rapid growth, and when covered in spring with myriads of flowers is an attractive plant for trellises or rustic summer-houses.—*Pueraria Thunbergiana* is a most vigorous climber, a single plant frequently covering an enormous space. The pea-shaped flowers appear in spring, are of a violet color and very fragrant. No better plant can be found for covering a large space in a short time. It is excellent for covering dead trees.—*Tecoma grandiflora* is one of the best exotic climbers, with very large and showy orange-red flowers, which are produced from spring until autumn. It can be trained with a single stem if supported for a few years. Several forms differ only in the size and color of the flowers, as *coccinea*, deeper red; *speciosaflora*, yellowish; *hybrida*, blood-red. The native species, *T. radicans*, is frequently considered a nuisance south in cultivated fields, but when trained to a pillar or frame few of our native climbers are as desirable.—*Wistarias*. Although the Japanese species frequently produces clusters more than a yard in length, the Chinese species is the favorite, being cultivated in purple, white and double forms. The double flowers are very full and of a beautiful shape, but the variety is unfortunately a shy bloomer. Our native species, *W. speciosa*, is superseded by an improved European form. Var. *magnifica* has flowers of a light lavender-blue, which are produced at intervals during the summer. Its growth is unusually vigorous.



2677. A grape-vine arbor.

II. EVERGREEN. *Akebia lobata*, with its large leaflets in 3's, yields an abundance of banana-shaped mucilaginous fruit, found in the markets of Japan, but here considered of indifferent value. A very robust climber. The "five-leaved akebia," *A. quinata*, is one of the most valuable rapid-growing climbers.—*Bignonia capreolata*, or Cross Vine, is found in rich woodlands: flowers brown-red, with yellow throat: blooms in spring.—*Clematis paniculata* is almost an evergreen, as it retains its foliage nearly all winter. Flowers are produced in the greatest profusion during midsummer and are very fragrant. One of the most desirable climbers.—*Cocculus Carolinus* twines to a height of 10–15 feet. When covered during winter with a profusion of coral-red berries there is no climber that is more graceful. Once known, in higher latitudes it would prove to be one of the most attractive greenhouse plants.—*Elæagnus pungens*, var. *reflexa*, or Japan oleaster, in good soil frequently makes a growth of 8 to 10 feet. The brownish bark contrasts well with the bright green and silvery reflexed leaves, while the clove-shaped flowers are very fragrant. Excellent for covering arbors.—*Ficus pumila*, although considered a tender exotic plant, has withstood severe cold weather and is very desirable for covering brick work, especially near the soil.—*Gelsemium sempervirens*, the Carolina yellow jasmine, is the glory of southern woods in spring, when plants climbing upon lofty trees are covered with myriads of golden yellow funnel-shaped flowers that are exceedingly fragrant. The form with double flowers has the additional merit of blooming during a much longer period than the type, and when cultivated in a cool greenhouse flowers are produced during winter.—*Hedera*. Of the many varieties of this genus there are few of the variegated-leaved that stand the southern summers, but the Irish and Algerian, the latter with unusually large leaves, are hardy and desirable.—*Jasminum nudiflorum* expands its bright yellow flowers in late winter and is valued as the earliest harbinger of spring; it is frequently used as a hedge plant when supported by a wire. *J. officinale* has white flowers during April and May. *J. Reevesi* and *J. humile*, with yellow flowers borne in summer and autumn, are great favorites.—*Kadsura Japonica* is valued chiefly for the reddish tint of its autumn foliage. The small white flowers are rather inconspicuous.—*Lonicera*.

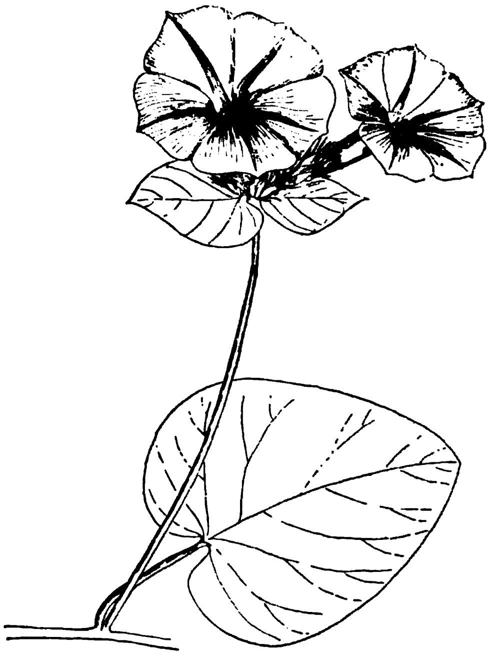
The following native species are all desirable; viz., *L. sempervirens*, with scarlet and orange flowers, and *L. flava*, with bilabiate buff-yellow flowers. In many sections of the South are found large patches of the exotic species, *L. Japonica*, vars. *flexuosa*, *Chinensis* and *Halliana*; these are frequently troublesome, as they choke out surrounding plants. Its Var. *aureo-reticulata*, with its attractive foliage, and *L. Periclymenum*, var. *Belgica*, which yields a continuous crop of pink and buff flowers, are the most valuable of the exotic sorts.—*Ipomœa*. *I. Bonariensis* (*Sellowii*) and *Leari* are the best of the tuberous section, the roots remaining sound during winter if slightly covered with litter. *I. pandurata*, known south as Indian bread, is frequently found in large quantities in newly cleared rich oakwood lands, the tubers often weighing 10 to 15 pounds. It is very showy with its large white flowers and purple inner tube.—*Passiflora*. Both Arc-en-ciel, with flowers combining white, citron and blue, and Constance Elliott, with pure white flowers, are perfectly hardy and profuse bloomers.—*Roses*. Of the climbing varieties there is a great profusion. Most varieties are either perfect evergreens or retain their foliage nearly all winter. The White and Yellow Banksias are wonderfully attractive in early spring when laden with innumerable small violet-scented flowers, while the climbing Tea, China, Noisette and Bourbon yield a profusion of variously colored flowers from early spring until winter. The Wichuraiana section will hardly become popular, as plants bloom only in spring, while the Cherokee and Macartney are still used for making evergreen hedges.—*Smilax*. Of the many species growing south, the *S. laurifolia* is highly valued for its large, shiny leaves; it is of great decorative value for ornamenting ballrooms. Other kinds are desirable both for leaves and berries.—*Trachelospermum jasminoides* is an excellent white-flowering climber. The variegated form does not grow as tall, but its foliage becomes beautifully tinted with gold and red in fall.

III. HALF-HARDY CLIMBERS. During the summer, southern homes are frequently adorned with a class of climbers that farther north are suitable only for greenhouse culture. Some of the best are mentioned below: The Antigonon, Aristolochia and Tecoma here mentioned will stand the winter if the soil is covered with a coat of straw or leaves. The stem dies down in fall, but the new growth appears vigorously in spring. The others need greenhouse protection north of Savannah, Ga. *Antigonon leptopus*. Flowers in long racemes of a beautiful pink color and produced from June until frost.—*Aristolochia elegans*. This blooms profusely from July until frost. The flowers are tubular, but the limb is perfectly flat and curiously marked and laced with purplish maroon.—*Bignonia*. *B. venusta* is at home in the extreme South. It is a gorgeous climber. In early spring or even as early as February it is covered with large bunches of bright orange-colored flowers. *B. speciosa* will stand the winters of southern Georgia and produces its purplish colored flowers in early spring.—*Bougainvillea glabra*, var. *Sanderiana*. Those who have seen this plant in Florida when in full bloom must agree that it is not surpassed by any other climber. The brilliancy of the climber is beyond description. Hardy south of Jacksonville.—*Tecoma Capensis*. Flowers in clusters of a beautiful orange-red color. Hardy as far as Savannah.

P. J. BERCKMANS.

Vines for Conservatories or Greenhouses. Flowering vines and climbers, when skilfully trained over the roofs, supports and sides of conservatories and other plant houses, add greatly to the attractiveness of such places. From the number of vines in cultivation good choice may be had both for cool or warm houses, and to suit every aspect, as well as for flowering at all seasons. Annual, bulbous and tuberous-rooted vines may be grown in pots or small tubs, but permanent hardwooded flowering vines must have ample root room. However, in some cases, as with the strong-growing bignonias and thunbergias, the root space must be limited, or there will be an immense growth at the expense of flowers.

When possible, the strongest growing vines may be planted under the greenhouse stages and the stems and branches trained up from the back to the sides and roof. In most modern greenhouses, however, the space underneath the plant stages is taken up by the heating pipes. To overcome this difficulty boxes made of one-inch cypress 5 feet long, 1½ feet wide and 1 foot deep are very suitable. These should be well drained, painted olive-green, and placed in convenient positions on the plant stages. In planting young vines the soil should be broken and not sifted; neither should the boxes be filled with soil at the time of planting, but the vine should be planted in a central mound and the box gradually filled as the plant grows. This practice is stimulating to the vines and tends to maintain the desirable qualities of the soil. Most vines may be trained on wires, which should be either galvanized or copper and of sufficient strength to support heavy vines. The wires should be spaced not more than 1 foot apart, and fastened in a horizontal position. The space between the wires and glass should be not less than 18 inches or the vines may freeze in winter.



2678. Vines—Ipomœa Leari (×⅓).

Some judicious thinning of the growth is generally necessary in order that the vines may receive sufficient light and air. The vines should not be tied in too closely, but allowed their natural habit of growth as far as possible in order to obtain the best effects.

A few of the most desirable kinds for conservatory and cool greenhouse follow, detailed culture of which may be found under their respective headings in this work. *Lapageria alba* and *rosea*, producing bell-shaped wax flowers of exquisite beauty, are well adapted for the back wall or north side. Their worst enemies are snails, which eat the young stems as soon as they push through the soil. *Tecoma jasminoides*, a strong-growing vine, produces clusters of jasmine-like flowers. *Luculia gratissima* makes one of the rarest and most beautiful coolhouse trellis plants. The cymes of rose-colored or pink flowers are produced in the greatest profusion during the early winter months. Its worst enemy is mealy bug. Dipladenias are excellent summer-flowering, tuberous-rooted vines, and their gorgeous flowers well repay the attention given them. *Ficus pumila* is an excellent subject for covering walls, either in cool or warm houses. *Solanum jasminoides* is a strong-growing vine producing clusters of jasmine-like flowers of white or lilac colors. The well-known Marechal Niel rose, the Cherokee rose (*R. Sinica*) and the Banksian rose, *R. Banksiæ*, are all excellent as conservatory and cool greenhouse climbers.

The following are among the choicest for warm house culture: *Allamanda Schottii* and *A. Hendersoni* are perhaps the best of the allamandas. They have no insect enemies and are of easy culture. Among aristolochias, *A. elegans* is the choicest, though *A. ornithocephalus* and *A. labiosa* are curious. *Bougainvillæa speciosa* and *glabra* are handsome stove climbers, and should be included in every collection. They are of easy culture and will flower profusely if given a light, warm position. *Clerodendron Thomsonæ* is perhaps too well known to require any comment. It should be in every collection. *Thunbergia laurifolia* is one of the handsomest of the thunbergias. It should be grown where it will be somewhat shaded during the warmer parts of the day, as the petals are so delicate that they fade quickly. Among passifloras the scarlet-flowered *P. racemosa* is excellent; also *P. alato-cærulea*. Their worst enemy is mealy bug. Hoyas, Stephanotis and *Plumbago Capensis* are all good. *Pothos celatocaulis*, sometimes catalogued as *Marcgravia paradoxa*, is a good plant for climbing trunks of palms or tree ferns or damp walls. *Cissus discolor* and *Asparagus plumosus* are both excellent for training up the supports of plant houses. *Solanum Wendlandii* is one of the best and showiest vines. EDWARD J. CANNING.

Vines for Southern California. The following list of vines for this section places them very nearly in their proper order as far as popular demand is concerned. One much-used vine, the ivy geranium, is purposely omitted for lack of knowledge as to its proper place in the list, the demand for this vine being somewhat spasmodic. The ivy geranium, being hardy here, is used for a great variety of purposes, as hanging baskets, hedges, and for climbing up the sides and on the roof of a house. Passifloras are unpopular here by reason of the numerous caterpillars that infest them at certain times of the year. Of this list *Solanum Wendlandii* is probably the most tender, with the bougainvilleas a close second. For the covering of unsightly objects in the least possible time, *Ipomœa Leari* (Fig. 2678) easily takes first place and the loniceras will rank next. Several species of jasmines are worthy of mention, but space forbids, as the list could easily be extended to 100 or more. Vines occupy an important place in the horticulture of southern California, as in other warm and sunny countries.

Bougainvillea, all species; *Bignonia venusta; Solanum Wendlandii;* Lonicera, several species; *Ipomœa Leari*, Fig. 2678; *Tecoma Ricasoliana; Jasminum grandiflorum; Bignonia Tweediana; Solanum Seaforthianum*, var. *azureum; Wistaria Sinensis; Wistaria Sinensis*, var. *alba; Solanum jasminoides; Tecoma grandiflora; Tecoma jasminoides ; Phaseolus Caracalla; Tecoma filicifolia; Hardenbergia monophylla; Hardenbergia Comptoniana ; Mandevilla suaveolens*, Fig. 2679 ; *Hoya carnosa ; Clianthus puniceus ; Akebia quinata ; Kennedya nigricans ; Muehlenbeckia complexa; Physianthus albens;* Various tacsonias; Figs. 2457, 2458, 2680. ERNEST BRAUNTON.

Vines for Middle California.—The number of species of climbing plants cultivated in California for ornamenting town and country homes is large, but on account of the newness of the country and the recentness of introduction of many of them, few species are commonly seen. In middle California (taking the San Francisco neighborhood as a center) the following are most extensively grown as a covering for porches, arbors and houses: (1) *Ampelopsis tricuspidata*, (2) *Rosa Banksiæ* and other species, (3) *Clematis Jackmani* and other varieties, (4) wistarias, (5) tacsonias and passifloras, (6) *Lonicera Japonica*, var. *Halliana*.

For house adornment the tacsonias are not to be recommended, on account of their rampant and dense growth, which tends to keep the building damp and cold in winter. The Lady Banks rose is a general favorite on account of its evergreen habit and the abundance of blossoms which it produces in spring. *Wistaria Chinensis* is an old and well-tried friend. In spite of a somewhat untidy habit of growth and need of yearly training and trimming, it is probably as much loved in California as in its native land, Japan, on account of the exuberant, lavish freedom with which it showers its wealth upon us in the form of immense trusses of fragrant flowers. Hall's Honeysuckle has such fragrant blossoms, is so easily reproduced by cuttings and blooms so freely and for such a long period, that it is more commonly grown in country places than perhaps any other vine.

The following lists are not intended to be complete, but rather suggestive; they are believed to include all the species generally grown in middle California. They are thrown into special-purpose groups.

Section 1.—For houses and places where dense growth would be objectionable. This list does not include all the species at present grown in such places, as several that are frequently so grown have proved unsatisfactory.

2679. Mandevilla suaveolens.

A. *Tall, suitable for covering the side of a house.*

B. *Hardy.*

Akebia quinata. Figs. 56, 57.
Ampelopsis heterophylla,
Ampelopsis quinquefolia. Fig. 80.
Ampelopsis quinquefolia, var. Engelmanni.
Ampelopsis tricuspidata. Figs. 81, 82.
Araujia sericofera (consult Physianthus),
Bignonia Tweediana,
Boussingaultia baselloides. Fig. 250.
Clematis Henryi. Fig. 488.
Clematis Jackmani. Fig. 489.
Clematis kermesina,
Clematis montana,
Clematis paniculata. Figs. 485, 486.
Dolichos lignosus,
Gelsemium sempervirens,
Holbœllia latifolia,
Ipomœa Bona-nox. Fig. 1170.
Ipomœa Mexicana,
Jasminum grandiflorum,
Jasminum humile,
Jasminum nudiflorum,
Jasminum officinale,
Kennedya rubicunda,
Lantana Camara. Fig. 1239.
Lonicera Caprifolium. Fig. 1316.
Lonicera Japonica, var. Halliana. Fig. 1314.
Lonicera Japonica, var. aureo-reticulata.
Lonicera Periclymenum. Fig. 1315.
Mandevilla suaveolens. Fig. 2679.
Maurandia Barclaiana,
Maurandia erubescens.
Maurandia scandens. Fig. 1378.
Melothria punctata,
Periploca Græca,
Plumbago Capensis. Fig. 1860.
Rosa Banksiæ,

Rosa lævigata. Figs. 2166 2167.
Rosa, various species.
Solanum jasminoides.
Stauntonia hexaphylla. Fig. 2395.
Tecoma grandiflora.
Tecoma jasminoides.
Tecoma Thunbergii.
Tecoma radicans.
Wistaria Chinensis.
Wistaria speciosa.
Wistaria multijuga.

BB. *Tender.*

Allamanda Hendersonii. Fig. 61.
Antigonon leptopus.
Bignonia venusta. Fig. 235.
Bignonia speciosa.
Bougainvillæa glabra. Fig. 249.
Bougainvillea glabra, var. Sanderiana.
Bougainvillæa spectabilis.
Bougainvillæa spectabilis, var. lateritia.
Buddleia Madagascariensis.
Eccremocarpus scaber.
Heliotropium Peruvianum. Fig. 1032.
Hoya carnosa.
Lapageria rosea. Fig. 1240.
Lapageria rosea, var. alba.
Phaseolus Carracalla.
Solanum Wendlandii. Fig. 2342.
Tecoma australis.

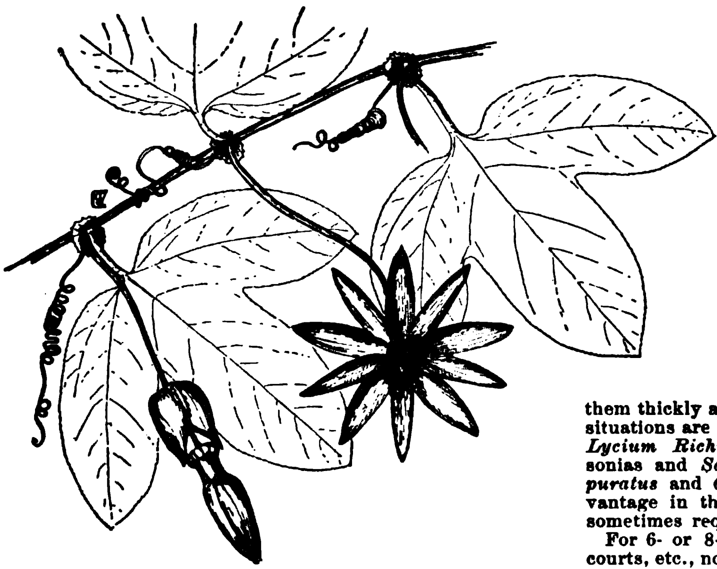
AA. *Low-growing climbers suitable for planting along a fence or wall or the base of a tree, or for massing against a house.*

B. *Hardy.*

Asparagus medeoloides. Fig. 152.
Clianthus puniceus.
Convolvulus luteolus, var. purpuratus.
Convolvulus macrostegius.
Ipomœa purpurea. Fig. 1167.
Ipomœa Quamoclit. 1166.
Jasminum humile.
Lantana Camara. Fig. 1239.
Lathyrus latifolius. Fig. 1243.
Lathyrus odoratus.
Lathyrus sylvestris.
Maurandia Barclaiana.
Muehlenbeckia complexa.
Pelargonium peltatum. Fig. 1702.
Swainsona galegifolia.
Vinca major.

BB. *Tender.*

Asparagus lucidus.
Asparagus plumosus.
Asparagus plumosus, var. tenuissimus. Fig. 156.
Asparagus Sprengeri. Fig. 153, 154.
Ficus pumila.
Heliotropium Peruvianum. Fig. 1032.
Lathyrus splendens.
Lycium Richii.
Manettia bicolor. Fig. 1359.
Pereskia aculeata.
Russellia juncea.
Tropæolum Canariense.



2680. Tacsonia manicata (×¼).

Section 2. *For arbors, porches and trellises where a dense and rapid growth is desirable.*

A. *Hardy.*

B. *Evergreen.*

Cobæa scandens. Fig. 502.
Ipomœa Leari. Fig. 2678.
Passiflora cærulea. Fig. 1653.
Pelargonium peltatum. Fig. 1702.
Tacsonia mixta.
Tacsonia mollissima.

BB. *Deciduous.*

Pueraria Thunbergiana.

AA. *Tender.*

Passiflora alato-cærulea.
Taesonia Exoniensis.
Tacsonia manicata. Fig. 2680.
Tacsonia Van Volxemii.

3. *For tree-trunks, unsightly poles, etc.*—For such places the English ivy, *Hedera Helix*, is one of the very best plants; it can be used with advantage to cover the trunks of eucalypts and to prevent the unsightly shedding of the bark without injury to the tree. The English ivy seems to be thoroughly at home in the coast climate of middle California. *Clematis montana* can be used with good effect to climb up among the branches of *Cupressus sempervirens* or *Chamæcyparis Lawsoniana*, against the dark foliage of which the white flowers of the Clematis contrast beautifully. Roses are often treated in the same manner. *Ampelopsis quinquefolia* is sometimes made to climb a rugged old specimen of *Cordyline australis*, and, often reaching the tufts of leaves which crown the short branches of the latter, the young lianas of the creeper hang down in beautiful festoons. In Golden Gate Park. *Tacsonia Exoniensis* has been allowed to wander at will over the rounded heads of live oaks (*Quercus agrifolia*). *T. mollissima* is sometimes used in the same way.

4. *For slopes, retaining walls and banks of creeks.*—For long, sloping banks nothing has yet been found more effective than English ivy, which withstands the dryness of a warm southern exposure without irrigation. *Pelargonium peltatum*, *Tropæolum majus*, *Juniperus Chinensis*, var. *procumbens*, and *J. Sabina*, var. *prostrata*, are also used satisfactorily.

Along the banks of creeks, *Senecio mikanioides* (here called German ivy), *Vinca major* and *Zebrina pendula* are frequently used, growing with the greatest luxuriance. The German ivy has escaped from these special situations and has established itself as a denizen in several places.

For low retaining walls and fences, English ivy is sometimes used, but is not nearly as effective as the following, all of which are met with:

Ficus pumila.
Fragaria Californica.
Fragaria Chiloensis.
Fragaria Indica.
Fuchsia procumbens.
Linaria Cymbalaria.
Lotus Bertholetii.
Mahernia glabrata.
Pelargonium peltatum.
Sollya heterophylla.
Tropæolum majus.

Of the above, *Pelargonium peltatum* is by far the most satisfactory and most freely used; in fact, it may be considered one of the characteristic features of gardening in middle California.

5. *For fences.*—Vines are frequently used to form live hedges by planting them thickly alongside a fence. The favorites for such situations are *Rosa lævigata*, *Muehlenbeckia complexa*, *Lycium Richii*, *Pelargonium peltatum*, the hardy tacsonias and *Solanum jasminoides*. *Convolvulus purpuratus* and *C. macrostegius* can also be used to advantage in this way, and even *Tropæolum majus* is sometimes requisitioned for the purpose.

For 6- or 8-foot woven wire fences, around tennis-courts, etc., nothing has been found more satisfactory than the delicate tracery of *Eccremocarpus scaber* and the maurandias; *Tropæolum Canariense* may also be used, but is less satisfactory because an annual and requiring a shady place. *Ipomœa purpurea* and *I. Quamoclit* may also be used for this purpose.

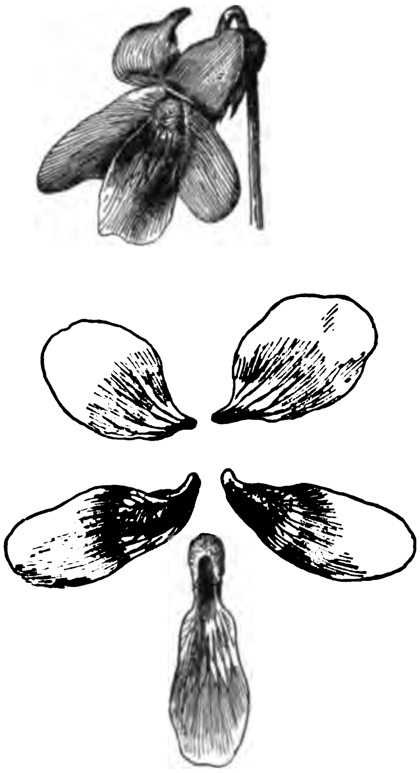
JOSEPH BURTT DAVY.

VINICULTURE. Wine-making and the subjects associated therewith. The subject is not primarily horticultural. It is essentially manufacture. The growing of the grapes is Viticulture. See *Grape* and *Vitis*.

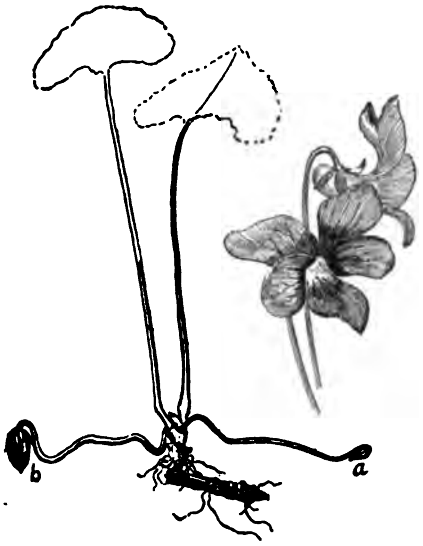
VÌOLA (classical name). *Violàceæ.* VIOLET. There are probably 150 species of Violets. They are widely distributed perennial or rarely annual herbs (or even subshrubs) with interesting irregular flowers on 1- or 2-flowered axillary peduncles. They are plants of the northern and southern temperate zones. About 40 species are native to North America north of Mexico. The flowers are 5-merous as to envelopes and stamens: sepals all similar, persistent with the fruit: corolla irregular, the lower petal spurred, the others similar but usually not alike; stamens short and included, the anthers more or less coherent and two of them with an appendage projecting into the spur: fr. a capsule, 3-valved, with several to many globular seeds. Some of the species (particularly the common eastern *V. palmata*) have cleistogamous flowers, which are borne at the base of the plant (often under the mold) and are pollinated in the bud. The structure of the corolla of the Violet is shown in Fig. 2681. In Fig. 2682, representing the same species, the cleistogamous flowers are shown at *a a*.

Three species of Viola are well known in gardens. The Common Sweet Violet is *V. odorata.* From this the florists' Violet, in many forms, has been evolved. The Pansy is *V. tricolor.* See *Pansy.* The Horned or Butterfly Violet is *V. cornuta.* These are all European species, and are now considerably modified by cultivation.

Many of the native Violas are offered by dealers in hardy plants, but only *V. pedata* and *V. palmata* (with its var. *cucullata*) are really known to any extent as garden plants; and even these are not frequently seen. *V. pedata*, the Bird's-foot Violet, is a most worthy species, and it will some day, no doubt, be the parent of an important garden race. It is very variable even in the wild state. Since the native species are really not horticultural subjects, and the descriptions of them are so easily accessible in the writings of Gray, Britton, Greene and others, and, moreover, the kinds are so many, they are not described in this account; but a list of those which are or have been offered in the trade is given below as a matter of record. In the nomenclature of this list, the monograph of Gray has been followed (Gray's Syn. Flora, vol. 1, pp. 195–204).



2681. The structure of the corolla of Viola palmata var. cucullata. Somewhat enlarged.



2682. The two kinds of Violet flowers,—the common showy flowers at the right, natural size, and the cleistogamous flowers at *a a* (× ⅛). Viola palmata var. cucullata.

Violets are easy to grow, particularly if an effort is made to imitate the conditions under which they naturally occur. Some of them are woods species, others swamp species, and others inhabit dry plains. They are propagated readily by means of division and in some species by runners. Sometimes seeds are used, but not commonly. Many species that grow mostly to single stems in the wild make large full clumps when given good opportunity in the garden. Fig. 2683.

A. *Plant perennial.*

B. *Spur short and obtuse.*

hederàcea, Labill. (*Erpètion renifórme*, Sweet. *E. hederàceum*, *petiolàre* and *spathulàtum*, G. Don). AUSTRALIAN VIOLET. Tufted, and creeping by stolons, glabrous or pubescent: lvs. reniform or orbicular or spatulate, small, entire or toothed, usually not equaling the scapes: fls. small, usually blue, sometimes white, the spur almost none. Australia.—Offered in S. Calif.

2683. Clump of common blue Violet of the eastern states.—Viola palmata, var cucullata.

odoràta, Linn. SWEET VIOLET. Figs. 2684, 2688–90. Tufted, somewhat pubescent, producing stolons: rootstock short: lvs. cordate-ovate to reniform, obtusely serrate, the stipules glandular: fls. blue, fragrant (running into white and reddish purple forms), the spur nearly or quite straight and obtuse. Eu., Afr. and Asia.—It runs into many forms, varying in stature, size of flowers and color. There are double-flowered forms. The parent of florists' Violets.

BB. *Spur long and acute.*

cornùta, Linn. HORNED VIOLET. BEDDING PANSY. Plant tufted, glabrous or nearly so, producing evident stems with long peduncles in the leaf-axils: lvs. cordate-ovate and usually acuminate, obtusely serrate, the stipules large and laciniate: fls. large, pale blue, the obovate-obtuse petals standing well apart, the spur half or more as long as the petals and acute. S. Eu. B.M. 791.—Frequently seen in gardens and much prized for its large, bright flowers. Good for spring bloom. Hardy. There are several colors, represented in Alba, Purpurea, Mauve Queen and Papilio. The last has very large flowers, violet in color, with small dark eye. Fig. 2685.

AA. *Plant annual, or imperfectly perennial in cultivation.*

tricolor, Linn. PANSY. HEARTSEASE. Figs. 1634, 1635. Glabrous or nearly so, the stems becoming long and branched: lvs. cordate or round-cordate, those of the stem becoming lanceolate, all stalked and crenate-dentate, the stipules large and laciniate: fls. large, usually about three colors represented (except in highbred self varieties), the spur short and inconspicuous. Eu. — When strayed from cultivation, the flowers become small and lose the markings characteristic of the highbred Pansies. A small-flowered field form, thought by some to be indigenous to this country as well as to Europe, is var. **arvénsis**, DC. See *Pansy*.

Following are North American Violas that have been offered to the trade:

A. *Blue Violets (sometimes running into white and striped forms).*

Beckwithii, Torr. & Gray. Nevada, Calif., Oregon.

Canadensis, Linn. Very pale violet or almost white. Generally distributed.

canina, Linn., var. ***Muhlenbergii***, Trautv. (*V. canina*, var. *sylvestris*, Regel). Minn., east. Var. ***adunca***, Gray (*V. adunca*, Smith). Mostly western.

cognata, Greene. Offered in Colorado.

Hallii, Gray. Calif. and Oregon.

palmata, Linn. (*V. cucullata*, var. *palmata*, Hort.). Eastern states.

Var. *cucullata*, Gray (*V. cucullata*, Ait. *V. obliqua*, Hill). Figs. 2681, 2682. On the Atlantic slope. By Britton & Brown regarded as a distinct species for which Hill's name *V. obliqua* (1769) is used rather than Aiton's *V. cucullata* (1789). The commonest Violet in the northeastern states. *V. obliqua*, var. *striata*, is a striped form now in the trade, and not uncommon wild. There are forms known as vars. *picta* and *variegata*. One of the most variable species in stature, form of leaves, and color of flowers. It is easily colonized in the garden.

pedata, Linn., Bird's-foot Violet, and one of the handsomest species. Sandy soil, Atlantic states and west to Ind. Terr. and Minn. It runs into very distinct forms.

Var. *bicolor*, Pursh. Two upper petals much darker.

Var. *alba*, Hort. Flowers nearly white.

rostrata, Muhl. Michigan, east.

sagittata, Ait. Minn. and Texas, east. Var. picta, Hort., has striped flowers.

Selkirkii, Pursh. Northeastern states and Canada.

trinervata, Howell. Washington.

2684. Viola odorata (× 1).

AA. *White Violets.*

blanda, Willd. Fig. 2686. Low places, across the continent. Pretty little species, fragrant. Var. *renifolia*, Gray. Northeastern states and Canada.

lanceolata, Linn. Nova Scotia to Florida and Texas.

primulæfolia, Linn. Canada to Florida and Louisiana.

striata, Ait. Yellowish white. Mo., east.

AAA. *Yellow Violets.*

glabella, Nutt Rocky Mts. to Calif. and Alaska.

lobata, Benth. Calif., Oregon.

Nuttallii, Pursh. Kans. to Calif. and north.

pedunculata, Gray. California seeds are gathered for export.

pubescens, Ait. Fig. 2687. Dakota, east and south.

rotundifolia, Michx. Nova Scotia to N. Car.

sarmentosa, Dougl. Idaho to British Columbia and Calif.

Sheltonii, Torr. Calif. to Washington.

L. H. B.

VIOLET. ***Commercial Cultivation.***—The Violet probably ranks third in commercial importance among florists' flowers in America. It has risen greatly in horticultural importance within recent years. The Violet season is only about seven months, while the season of roses and carnations is fully nine months. As with the other leading flower crops, — roses, carnations and chrysanthemums, — the Violet requires very close attention the year round. Though Violets require no staking, tying or disbudding, other laborious practices are necessary. The status of Violet culture has been below that of the other important florists' flowers as regards general care and efficiency of management, and consequently quality of product. For many years a crop worth millions of dollars annually was raised with scarcely any discussion in the trade papers concerning methods. There are national societies devoted to the rose, carnation and chrysanthemum, but none to the Violet. So low had the interest sunk in Violet culture on its professional side that the "Violet disease" was spoken of by the florists as if it were only one thing, whereas there are at least eight distinct and important kinds of troubles that devastate Violet plants. At last the tide has turned. The various diseases have been investigated by scientists, especially those of the Division of Vegetable Physiology and Pathology, in the U. S. Department of Agriculture, and there is considerable free literature available concerning the nature of these diseases and the methods of controlling them. The wonderful success of certain Violet specialists has awakened general interest and emulation. Violet culture now receives something like its proper share of attention in the trade papers. The practical experiments in Violet culture by Galloway and Dorsett, based upon a knowledge of plant diseases, the introduction of the cyanide method of fumigation, a rigorous system of plant-breeding and a close study of actual market conditions have had an important influence in raising the standard of commercial Violet culture.

There is a popular impression that Violets are an easy

2685. Viola cornata var. Papilio (× ⅓).

crop to grow. This is true only of blooms of ordinary quality and only as regards the total amount of work required per year as compared with a crop of roses, carnations or chrysanthemums. The best Violets are produced only under the best conditions, and it is a singular fact that many persons who have thought they had mastered Violet culture after a few years' success have failed subsequently. The Violet is still everywhere grown by local florists, but good Violet culture has been the latest to attain a high degree of specialization. The present status of the subject is admirably presented in Galloway's Commercial Violet Culture, New York, 1899.

Varieties.—From *Viola odorata*, a species indigenous to Europe, parts of Asia and Japan, many cultivated sorts, both single and double, and of different colors, have been derived. The varieties most highly prized and of the greatest commercial value to American florists are, in the order named: of the double varieties, Marie Louise (Fig. 2688), Farquhar, Imperial, New York (Fig. 2690), and King of Violets, dark blue flowers; Lady Hume Campbell, Neapolitan (Fig. 2689) and De Parme, light blue; Swanley White (Fig. 2691), Queen of Violets and Belle de Chatenay, white, and Madame Millet, Odorata Rubra and Double Red, red or pink. Of the single sort the varieties most highly prized are, in the order named: California, Princesse de Galles, Luxonne and La France, purple; White Czar and Rawson's White, white, and single red or pink.

2686. Viola blanda (× 1).

Propagation.—In commercial Violet growing, plants are propagated chiefly in four ways: (1) By cuttings 3 or 4 in. long, made from well-developed runners and rooted in clean, sharp sand; (2) by divisions, made by taking up the old plants, usually after flowering has ceased, and separating them, all divisions with old roots and hard woody stems being discarded, and the young, well-rooted ones transplanted 3 or 4 in. apart each way, and watered and shaded for a few days, until they are well established, when they can be lifted with a ball of earth and set where desired; (3) by cuttings made from young, unrooted crowns or divisions of the old plant removed during the winter or spring without disturbing the flowering plant, and rooted in clean, sharp sand, as in the case of runners; (4) by removing well-rooted young divisions, crowns or offshoots, without disturbing the flowering plant and caring for them the same as divisions made in spring.

Soil.—As a rule, Violets do well in any good, well-enriched soil. The best results, however, are obtained from soil prepared from sod taken from a rather heavy, sandy loam that is well drained and capable of retaining and giving up an abundance of moisture at all times. The soil to be used in the Violet house, stationary frame, or in pots, should be prepared the previous fall. From a suitable loam, strip off the sod to a depth of 3 or 4 in.; compost this with well-rotted manure, preferably cow manure, and pile in alternate layers of from 6 to 8 in. of sod and 2 to 3 inches of manure. In this condition let it stand exposed to the weather until spring, and then, just before it is to be used, chop down and add pure bonemeal at the rate of 27 ounces per cubic yard of soil, after which work over several times, or until the whole is thoroughly pulverized and mixed, when it is ready for use. For movable frame culture, scatter from 1 to 2 in. of well-rotted manure over the sod in the fall, then turn under by spading or deep plowing, and in that condition let it stand exposed to the action of the weather until spring. Just before planting time plow again, top-dress with pure bonemeal at the rate of 6 ounces per square yard of soil, and harrow or work over.

2687. Viola pubescens (× ⅓).

Methods of Culture.—Among American florists four methods of growing Violets are in common use; viz., field and house culture, house culture, frame culture with or without artificial heat, and pot culture, the extent to which they are used being in the order named.

Field and house culture: Early in the spring the young plants are set in the field and cultivated during the summer. Some time in September or October they are lifted with a ball of earth and transplanted into beds or benches in the house, where they bloom during the winter.

House culture: The plants are grown under glass, either on benches or in solid beds, during the entire season. This method should take the place of all others, for with it the very best conditions and closest attention can be given the plants at all times, and as a rule the results obtained are much better than from any other method.

Frame culture with or without artificial heat: The young plants are placed either directly in the frames, where they are to grow and flower, or else in beds, where they are cultivated during the summer and the frames placed over them in the fall, or as soon as they require protection; or they are grown in the field as in the case of field and house culture, and transplanted to the frames some time in September or October. This method is still used to considerable extent by commercial growers, especially in regions where the temperature seldom if ever falls below zero for any length of time. Amateur growers usually adopt this method because of its simplicity and inexpensiveness.

2688. Violet, Marie Louise (× 1).

Pot culture: The young rooted cuttings are planted in thumb-pots and gradually shifted to larger sizes as growth demands until they are in 7-in. pots. Here they are kept and flowered, or the plants are taken up from the field in the fall and put into 7- or 9-in. pots, according to the size and vigor of the plants. This method is seldom used in commercial growing, being expensive, inconvenient and usually unsatisfactory.

Time of planting: This varies somewhat with different growers and in different sections. Generally, however, the best results are obtained where planting is done in early spring. Plants set out at this time get well established, and as a rule are stronger, healthier and 'more vigorous than those set out later, when the weather is usually hot and dry.

Proper distance in planting: As a rule, the double Violets are planted 8 or 9 in. apart in rows 10 in. apart, and the single ones 12 in. apart in rows 12 to 18 in. apart, the distance depending somewhat on conditions and varieties. Planting too close is liable to induce disease, and too far apart is unprofitable.

Care and management: The plants should be kept free from all weeds, runners and old decaying leaves, and the earth should be frequently stirred, care being taken not to injure the roots of the plants. During the summer the temperature should be kept as low as possible and in the winter as nearly as possible at 45° to 50° F. at night and 50° to 60° in the daytime. The ventilation of the houses should receive careful attention at all times, so that an abundance of fresh air can be supplied to the plants when needed. Watering is a difficult problem, usually taxing to the utmost the best judgment of the grower. No fixed rules can be laid down as to the proper amount to apply or when to apply it, this depending upon a number of factors, such as the character of the soil, temperature and moisture of the atmosphere, amount of light, etc. As a rule, however, the soil should be kept moist at all times, and the watering should be thorough, but never to such an extent as to cause the soil to remain saturated for any considerable length of time.

Violet Houses and Frames (Fig. 2692). — There is probably little choice between any of the standard styles of greenhouses, provided certain features are observed in their construction. Provision should be made for supplying an abundance of fresh air, either from the sides or top, whenever it is needed, the ventilators being so arranged as to be easily operated either from within the house or from the outside, the inside arrangement to be used in general ventilation of the houses, the outside whenever fumigation with hydrocyanic acid gas is necessary. The arrangement and location of the house should be such as to secure the maximum amount of sunshine during December and January, and the minimum amount during the growing season, when it is necessary to maintain as low a temperature as possible so as to insure good, vigorous, healthy-growing plants. The location of the house and the direction in which it should run depend largely on the section of the country, the character of the ground on which it is to be erected, and the style of house selected. Generally speaking, the even-span house should run north and south, the three-quarter span and the lean-to east and west. The best site for the house is a level piece of land or one sloping gently to the south. Three kinds of greenhouse framework are in common use in this country; viz., wood, wood and iron, and iron. On account of its comparative cheapness and durability the wood and iron framework is coming into general use.

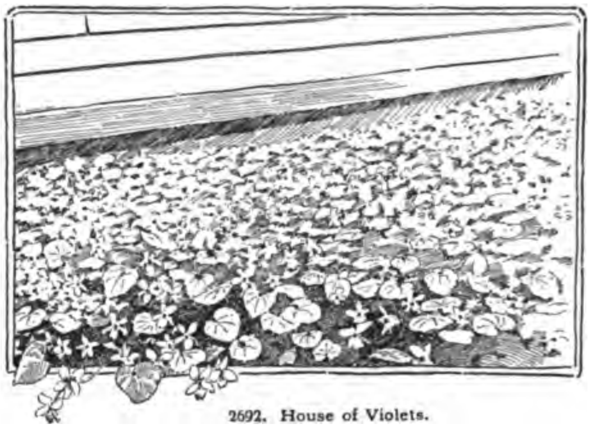
2689. Neapolitan (× 1).

2690. New York (× 1).

The Violet frames, which are either stationary or movable, are made of rough boards, and are about 5 ft. 10 in. wide, of any desired length, from 12 to 15 in. high in front and 18 to 20 in. high at the back. The best location for the frames is a piece of ground sloping to the south, with a wind-break of some kind to the north and northwest to protect them during the winter from the cold winds.

Marketing is one of the most important factors connected with commercial Violet-growing and is seldom understood in all its details. The grower should be thoroughly familiar with the many needs and requirements of the market and be able to supply these demands, for upon his ability to do this depends largely his success or failure from a financial standpoint. Violets are prized chiefly for their delicate perfume, and as this diminishes in proportion to the length of time they are picked, the best market, other things being equal, is the one which requires the least possible delay between picking the flowers and placing them in the hands of the customer.

The crop may be disposed of at retail or wholesale or through a commission merchant. Each method has its advantages and disadvantages, and in deciding which one to adopt the grower must be guided by existing conditions. He must in any event have a thorough knowledge of the requirements of the market as regards quality of the flowers, size, shape and arrangement of the bunch, and should at all times exercise the utmost care in picking, packing and shipping, so that the flowers may reach the customer in the best and most attractive condition. The kind of bunch varies from year to year, and each large city is likely to have its own style. The various styles are wonderfully exact in their requirements and great skill is required to bunch the flowers properly.



2692. House of Violets.

2691. Swanley (× 1).

Diseases. The cultivated Violets are subject to a number of diseases, each of which is characterized by one or more distinct symptoms. The principal diseases are as follows, their destructiveness being in the order in which they are discussed:

Spot disease (*Alternaria violæ*).—This disease, also called the disease, leaf-spot, leaf-rust and smallpox, is the most widespread and destructive known in America. It attacks principally the foliage, normally producing definite circular whitish spots, frequently with concentric rings, of a darker shade, very often with a light central portion resembling the bite or sting of an insect. *Cercospora violæ*. *Phyllosticta violæ*, *Septoria violæ*, etc., produce spots very similar in outline and appearance to those caused by *Alternaria violæ*, but only under conditions peculiarly favorable to these fungi do they cause any serious loss. For recent information on this disease, see "Spot Disease of the Violet," Bull. 23, Div. Veg. Physiology and Pathology, U. S. Dept. Agric.

Root rot (*Thielavia basicola.*).—This disease is very troublesome and destructive in some localities especially to young plants that are transplanted during hot, dry weather. It causes the browning or blackening of the parts attacked and the final death of the plant.

Wet rot (*Botrytis sp.*).—This fungus attacks leaves, detioles, flower-stalks and flowers, causing a wet or soft rot. It is sometimes very destructive, especially with large plants growing in a damp, stagnant atmosphere, where there is insufficient ventilation and light.

Leaf-fading or yellowing.—This is induced by a variety of conditions, but as yet little that is definite has been ascertained regarding its cause.

Remedies.—It is difficult to exterminate any of the diseases named after they once gain a foothold. However, they can be held in check and often entirely prevented by selecting and propagating exclusively from strong, vigorous, disease-resistant plants, and by keeping them in the best possible growing condition. Careful attention must be given to watering, cultivation and ventilation, and the dead and dying leaves and all runners should be destroyed as fast as they appear.

Animal Enemies.—Although Violets are attacked by a number of insects and other animal enemies, only a few do sufficient injury to warrant discussion here.

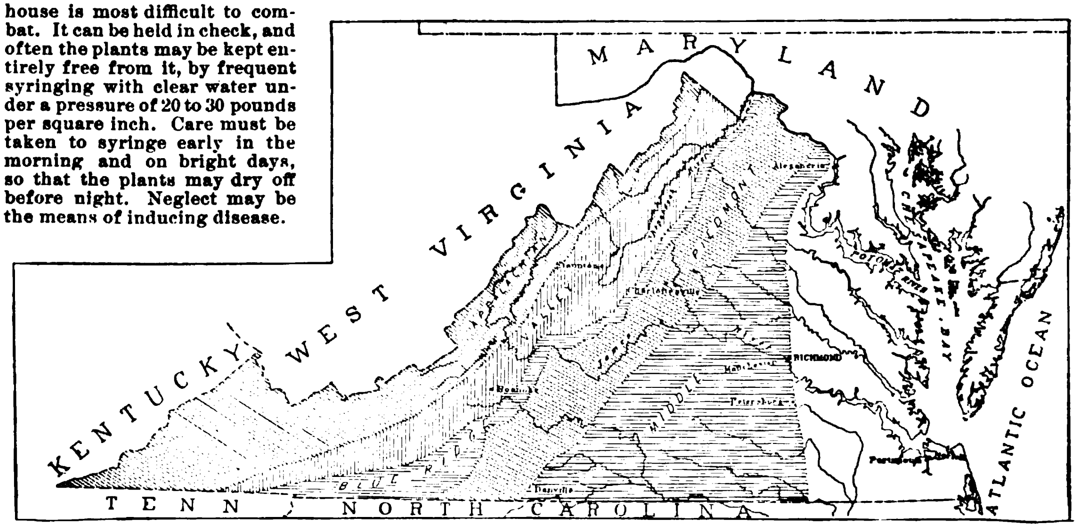
Aphides (Aphis ? sp. and *Rhopalosiphum violæ*).—These pests are generally known as the green and the black aphis or the green and the black fly. They cause the young, growing parts to curl and twist, resulting in a stunted, ill-formed plant. They work their way into the young, unopened flower-buds, and, thrusting their bills through the overlapping petals, feed on the juice. Each puncture produces a greenish white blotch on the petal and the flower becomes dwarfed, distorted and worthless for market. Aphides can be easily controlled by fumigating with hydrocyanic acid gas, and this is the method of treatment which should come into general use. To each cubic foot of space in the house or frame use .15 gram of 98 per cent cyanide of potash for double varieties and .10 gram for single varieties. Handle the cyanide and gas with utmost care, as both are very poisonous. Divide the total amount of cyanide into as many equal parts as there are jars used, which latter should be one for every 50 to 75 lineal feet of a house 12 to 18 feet wide. Put each part into a 2-pound manila paper bag and this into a second bag. Attach each package to a string or wire so arranged as to allow it to be lowered from the outside of the house into its respective jar. Pour into each jar an amount of water about equal to the bulk of cyanide in the bag, add commercial sulfuric acid until steam is evolved, then from the outside lower the bags into the jars beneath. Fumigate double varieties thirty minutes and single varieties twenty minutes, after which open ventilators from outside, leaving them open at least sixty minutes before entering the house (for full information, see Circular 37, Dept. of Agric., Div. of Entomology). Aphides may also be combated by using tobacco in some one of its many forms, but tobacco is likely to weaken the leaves and make them more liable to the attack of fungi, and on this account is very objectionable.

Red spider (*Tetranychus telarius*).—This pest lives on the under surface of the leaves, and when present in sufficient number causes considerable damage. It is widely distributed on a great variety of plants, and when established in the Violet house is most difficult to combat. It can be held in check, and often the plants may be kept entirely free from it, by frequent syringing with clear water under a pressure of 20 to 30 pounds per square inch. Care must be taken to syringe early in the morning and on bright days, so that the plants may dry off before night. Neglect may be the means of inducing disease.

VIRGINIA CREEPER is *Ampelopsis quinquefolia.*

VIRGINIA, HORTICULTURE IN. Fig. 2693. Historically Virginia horticulture began with the earliest settlers, plantings being made on Jamestown Island in 1607. The London Company sent vines in 1619 and scions and trees in 1622 which were rapidly disseminated, so that before 1700, orchards of considerable size had been planted. As the settlers pushed westward into the Piedmont section, favorable results with the tree fruits became more common. In this section Thomas Jefferson took an active interest in horticulture, and from the vicinity of "Monticello," apples first won their supremacy in the markets of the world.

Virginia is separated into six main physical divisions known as Tidewater, Middle Virginia, Piedmont, The Valley, Blue Ridge and Appalachian. These are sections of varying width, extending northeast and southwest through the state, with marked variations in soil, altitude and climate.



2693. Map of Virginia. Showing the six regions of interest to farmer and fruit-grower.

Eel worms, or nematodes (*Anguillula* sp.).—This causes swellings on the roots of the plants known as root galls. Another species attacks the buds, causing them to "go blind." There is no known method of exterminating these pests, but their injurious effects may be reduced to a minimum by adopting the methods recommended for controlling fungous diseases.

Gall fly (*Diplosis violicola*), violet sawfly (*Emphytus Canadensis*), greenhouse leaf tier (*Phlyctænia rubigalis*) and several species of cutworms (*Agrotis et al*). —In some parts of the country the larvæ of these insects injure the plants to some extent by feeding on the foliage. Fumigating with hydrocyanic acid gas is the best means of combating them.

Slugs, snails, sow bugs, etc.—Under certain conditions these pests do considerable damage, especially to the flowers. They also can be controlled by the hydrocyanic acid gas treatment.

P. H. DORSETT.

VIOLET, AFRICAN. *Saintpaulia.* **V., Damask** or **Dame's,** is *Hesperis matronalis.* **V., Dog.** *Viola canina.* **V., Dog's Tooth.** *Erythronium Dens-Canis.* **V., Water.** See *Hottonia.*

VIPER GOURD. *Trichosanthes Anguina.*

VIPER'S BUGLOSS. See *Echium.*

VIRGÍLIA lùtea. See *Cladrastis tinctoria.*

VIRGINIA COWSLIP or **V. Lungwort** = *Mertensia pulmonarioides.*

Orcharding.—It is in the larger fruits that Virginia horticulture has won most renown. The present production of apples is about 500,000 barrels, the bulk of which is produced in The Valley and Piedmont sections. Piedmont, Virginia, with a varying altitude of 500 to over 1,000 feet, and a soil ranging from dark red to black, is famous as the producer of the most perfect type of Albemarle Pippin and Winesap apples. Situated in mountain coves, and on hillsides in many instances barely arable, these orchards enjoy specially favored conditions, and yield almost fabulous returns, an individual tree having produced $100 worth of fruit in a season though practically uncared for. In this section the apple probably reaches its greatest development of tree growth, with a maximum of 9 ft. 5 in. in circumference of trunk; 90 ft. spread of branches, and a yield of 130 bus. at one picking. The Valley leads in apple production, and here the largest orchards are found with 40,000 or more trees under one management. Limestone in formation and with an altitude of from 500 to 2,500 feet, this section is admirably adapted to fruit culture. It grows York Imperial and many other apples to perfection.

The Blue Ridge and Appalachian sections, with altitudes of from 2,000 to 4,000 feet and rich limestone soils, have been practically undeveloped horticulturally, but so far as tested are a field of rich promise. Among the cultivated fruits of Virginia the apple takes first rank. Early May, Red June, Early Harvest and Yellow Transparent as the leading first earlies, open the season the latter part of June and carry the season into July, when the succession is taken up by Sweet Bough, Astrachan, Maiden's Blush, Summer Queen and Pennock, followed by Bonum, Smoke House, Fall Pippin, Fallawater, Sweet Winter Paradise, and Virginia Beauty as leading fall apples, and concluded by York Imperial, Albemarle Pippin, Ben Davis and Winesap, which extend the season through winter.

The planting of pears for commercial purposes has largely increased with the introduction of Kieffer, Le Conte and others of this type, while Seckel, Bartlett, and Duchess remain the favorites for garden purposes. In peaches the varieties largely planted are Sneed, Alexander, Greensboro, Mountain Rose, Early Rivers, Bishop Early, Chinese Cling, Crawford Early and Late Elberta, Stump the World, Heath Cling, Levy Late, Bilyeu October and Albright Winter. It is the general experience that in early peaches white-fleshed varieties do best. Sweet cherries probably grow to greater perfection in Virginia than elsewhere east of the Rocky Mountains, $60 worth of fruit from an individual tree in a season being no unusual occurrence. The most popular varieties are Early Purple, Black Tartarian, Napoleon Windsor and Gov. Wood. It is considered among observant growers that Mahaleb is a failure as a stock for sweet cherries for orchard purposes in Virginia, and the most successful stock is the Mazzard, which grows with such luxuriance as often to become a striking feature of a Virginia landscape.

With the advent of the Japanese types, the plum industry is taking on renewed life and plum orchards of considerable size are being planted. Red June, Abundance, Yellow Japan, Burbank, and Wickson have proved profitable about in order named. Satsuma preserves well. The Damson and a blue plum of the "Horse" plum type are very commonly disseminated throughout the state. The latter reproduces itself in the same manner as the Damson, and seems to be exempt from black knot. Only a few trees of the last two kinds are grown at any one place, but the aggregate of fruit is considerable. Nearly all the pome and stone fruits adaptable to this climate are grown in the state, but few on a commercial scale except as noted.

Vineyards.—That section of Piedmont Virginia near Charlottesville has taken the lead in grape-growing, and extensive vineyards of wine grapes have been planted, and a wine cellar established, whose product has been favorably compared with the best French wines of same character.

Small fruits.—Raspberries are grown in sufficient quantities to supply local demands, with Cuthbert as the leading variety. The same may be said as to gooseberries and currants, with Houghton and Downing popular varieties of the former and Cherry and Fay of the latter. Strawberries are grown extensively in a number of localities both for local and distant markets, with the vicinity of Norfolk the center of production. From Norfolk they are shipped by boat- and train-loads, and "the patches" are often 100 acres or more in size. Blackberries and dewberries are furnished so bountifully by nature that stimulus for cultivation is held in check, as is the case so far as home consumption goes with many other fruits, for from early spring strawberries, service berries, dewberries, blackberries, huckleberries, Mazzard cherries, haws, wild grapes, plums, seedling apples, pears and peaches follow each other in such reckless profusion in field and forest that all who wish have but to pluck to eat. Commercially, however, the horticulture of Virginia is making rapid strides in methods and increased plantings.

Trucking.—Tidewater ranks first in its trucking and small fruit interest. With its mild climate, tractable soil, abundance of labor, thorough transportation facilities, low freight rates, and nearness to great eastern markets, it has in the last 36 years become the "Market Garden of the World," the section adjacent to Norfolk producing over six millions of dollars worth of truck per annum. See *Vegetable Gardening.*

Nurseries.—The 50 or more nurseries in the state are well distributed, with the largest establishments at the junction of the Tidewater and Middle Virginia sections. These nurseries comprise plants of from 350 acres down. The apple is their leading specialty.

Floriculture and landscape gardening have been principally confined to the larger cities of the state, where there has been a rapid increase of glass acreage in recent years devoted mainly to the production of roses, carnations, violets, and chrysanthemums as cut-flowers. The soil and climate of Middle Virginia have been found especially favorable to violet production and in Louisa county, 25 or more growers are devoting especial effort to violet culture. The interest in landscape gardening is gradually on the increase. GEO. E. MURRELL.

VIRGINIA STOCK. *Matthiola.*

VIRGIN'S BOWER. *Clematis.*

VISCÀRIA. See *Lychnis.*

VÍSCUM is mentioned under *Phoradendron.*

VÍSNEA (after a Lisbon merchant). *Ternstrœmiàceæ.* A genus of one species confined to the Canary Islands. It is a large evergreen shrub or small tree resembling in a general way a tea plant or camellia. The specific name Mocanera was given by the younger Linnæus because the fruit was supposed to be the "mocan" of the aborigines, which was made into a kind of syrup and used to a considerable extent. The fls. are only three-eighths of an inch across, not very numerous and much shorter than the lvs., but they are very sweet-scented. It has recently been offered in S. California.

Sepals 5, imbricated; petals 5, imbricate, connate at base; stamens indefinite: ovary 3-loculed, slightly immersed in the torus: ovules 3 in each locule, pendulous from the apex; fr. an indehiscent berry included by the enlarged and fleshy calyx, which is adherent to the base.

Mocanèra, Linn. f. Tender evergreen shrub, 6–9 ft. high, of compact habit and with dark green, shining leathery foliage: lvs. short-petioled, ovate-lanceolate, serrate: fls. solitary, white, pendulous. Canaries.

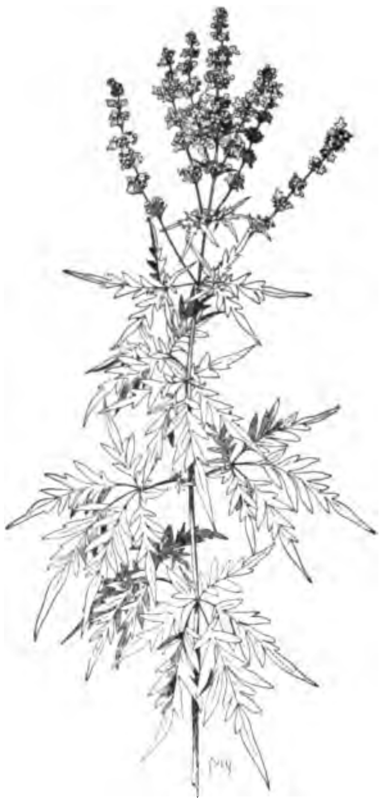
W. M.

VÌTEX (ancient Latin name for this or a similar shrub). *Verbenàceæ.* Ornamental deciduous or evergreen trees or shrubs with opposite, digitate or rarely simple leaves and usually with small white, blue, violet or yellowish flowers in axillary cymes often disposed in large, terminal panicles. Most of the species are inhabitants of tropical and subtropical regions and only a few can be cultivated outdoors in temperate regions. The hardiest seems to be *V. incisa*, which stands most ordinary winters as far north as Massachusetts. *V. Agnus-castus* is hardy as far north as New York, in sheltered positions. These species are particularly valuable for their late-appearing flowers. They grow in almost any kind of soil and prefer rather dry, sunny situations. None of the tender kinds seem to be in cultivation in this country. They thrive in a sandy compost of peat and loam. Propagated by seeds sown in spring and by greenwood cuttings under glass; also by layers.

About 60 species are known, distributed through the subtropical and tropical regions of both hemispheres, few in the temperate regions. Lvs. opposite, digitate, with 3–7, rarely with one leaflet: fls. in often panicled, few- to many-fld. cymes: calyx campanulate, usually 5-toothed; corolla tubular-funnelform, with 5-lobed, oblique and slightly 2-lipped limb; stamens 4, 2 longer and 2 shorter ones: fr. a small drupe, with a 4-celled stone. Some species, particularly *V. altissima* and *V. Leucoxylon* in S. Asia are important timber trees.

Agnus-cástus, Linn. CHASTE-TREE. HEMP-TREE. MONK'S PEPPER-TREE. Shrub or small tree, with a strong aromatic odor, grayish tomentose: lvs. long-stalked; lfts. 5–7, lanceolate, acuminate, narrowed at the base into a short stalk, entire or with few coarse teeth, grayish tomentose beneath, the middle one 3–4 in. long, the fls. in dense, sessile clusters, forming terminal, often panicled racemes 5–7 in. long: corolla usually pale or lilac, grayish outside, ⅜ in. long; stamens and style exserted. July–Sept. S. Eu., W. Asia. Mn. 2, p. 44. —Var. **álba,** Hort. (*V. albiflòra*, Hort.). Fls. white. Var. **cærùlea,** Hort. Fls. blue.

incisa, Lam. (*V. laciniàta*, Hort.). Fig. 2694. Similar to the preceding: lfts. incisely serrate or almost pinnatifid, grayish tomentulose beneath, the middle one 2–3 in. long, the smallest ones often entire: fls. smaller, scarcely ¼ in. long, in more slender and looser terminal panicles; stamens shorter than limb; throat villous. July, Aug. N. China, Mongolia. B.M. 364 (as *V. Negundo*). Less showy in bloom than the preceding species, but a graceful shrub of loose and open habit, with handsome foliage.



2694. Vitex incisa (×⅛).

V. ilicifòlia, A. Rich. Lvs. simple, short-stalked, oval, spiny-toothed: fls. in long-stalked, axillary, many-fld. cymes. Cuba. —*V. Lindeni*, Hook. f. Lfts. 3–5, elliptic or elliptic-obovate, glabrous: fls. pale violet, in few-fld., axillary, long-stalked heads. Colombia. B.M. 6230.—*V. Negúndo*, Linn. Closely allied to V. incisa, but lfts. entire or crenately serrate, larger: fls. purple, somewhat larger. Tropical and subtropical Asia.—*V. trifòlia*, Linn. Lfts. usually 3, obovate or obovate-oblong, obtuse, entire: fls. blue, in terminal panicles. S. Asia, Polynesia. Var. unifoliolata, Schauer. With a solitary short-stalked leaflet.

Alfred Rehder.

VITICULTURE. See *Grape* and *Vitis*.

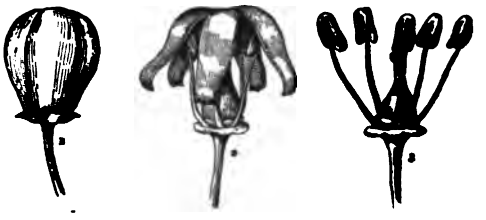
VÌTIS (classical Latin name). Vine. Grape. *Vitàceæ* or *Ampelideæ*. A widespread genus of mostly tendril-bearing climbing vines, most abundant in temperate countries. In its stricter limitations, the genus includes less than 50 known species, but some authors unite Cissus and Ampelopsis with it, when it includes some 250 species. The latest monographer (Planchon, DC. Monogr. Phaner. 5), refers thirty or more species to Vitis in the main account and in the addendum, and more than 200 to Cissus. North America is particularly rich in Vitis, not only in number of species but in the widespread distribution and the abundance of the plants. From our native species have been developed the outdoor Grapes of this country except those of California and the extreme southwest (which are *Vitis vinifera*). For an account of the evolution of these native cultural varieties, see *Grape;* also Bailey's "Sketch of the Evolution of Our Native Fruits."

Many of the species of Vitis are excellent ornamental plants, when it is desired to cover arbors, porches or trees. All of them are readily grown from seeds, and most of them from hardwood cuttings. Only a few of the native species are regularly in the trade; but with the possible exception of *V. Treleasei* they have been offered for sale to experiment stations and amateurs by T. V. Munson, of Texas, who is a well-known authority on both the botany and horticulture of the Grape. The popular interest in these species is primarily pomological; for, although the fruit may not be directly useful, the species give promise of development through hybridization and plant-breeding, and some of them afford useful stocks on which to graft kinds that do not resist the phylloxera or root-louse. The following discussion includes all the species native to North America north of Mexico; it is adapted from the writer's account in Gray's Synoptical Flora, vol. 1, 420–430. These American Grapes are very difficult to distinguish in many cases; hence the subjoined descriptions are very full in order to bring out the contrasting characters. Some of the best recent systematic writing on American Vitis is from French sources, since the American species have come into prominence in France as phylloxera-resisting stocks for the Wine Grape. See, for example, the works of Millardet, and Viala and Ravaz; also "Ampélographie Universelle," by Viala and Vermorel, now publishing.

As understood by Gray, Vitis is distinguished as follows: Plants climbing by the prehension and coiling of naked-tipped tendrils. Flowers polygamo-diœcious (i. e., some individuals perfect and fertile, others sterile with at most only a rudimentary ovary), 5-merous; corolla calyptrately caducous,—the petals in anthesis cast off from the base while cohering by their tips (Fig. 2695): hypogynous disk of 5 nectariferous glands alternate with stamens: style short and thick, or conical: berry pulpy; seeds pyriform, with contracted beak-like base.

INDEX.

✓ æstivalis, 22.
Americana, 22.
angulata, 5.
antarctica, 1.
araneosus, 22.
argentifolia, 23.
Arizonensis, 18.
Arizonica, 18.
Baileyana, 15.
Baudiniana, 1.
Berlandieri, 16.
bicolor, 23.
Blancoi, 24.
Blandi, 27.
Bourquiniana, 22.
bracteata, 22.
Californica, 19.
candicans, 25.
canescens, 17.
Caribæa, 24.
Champini, 12.
cinerea, 17.
Coignetiæ, 2.
cordifolia, 14.
coriacea, 25.
dissecta, 7.
diversifolia, 22.
Doaniana, 21.
fœtida, 14.
Foexeana, 8.
Floridana, 5, 17.
Girdiana, 20.
glabra, 18.
glauca, 22.
gongylodes, 4.
Helleri, 14.
hypoglauca, 3.
Illinoensis, 9.
Labrusca, 27.
Linsecomii, 22.
Longii, 11.
microsperma, 12.
Missouriensis, 9.
monosperma, 13.
monticola, 8.
Munsoniana, 6.
muscadina, 5.
Mustangensis, 25.
Nortoni, 22.
Nuevo-Mexicana, 11.
occidentalis, 22.
odoratissima, 9.
palmata, 13.
peltata, 5.
præcox, 9.
pterophora, 4.
pullaria, 14.
rotundifolia, 5.
riparia, 9.
rubra, 13.
rupestris, 7.
sempervirens, 14.
Simpsoni, 26.
Solonis, 11.
sylvestris, 22.
taurina, 5.
tenuifolia, 9.
Texana, 8.
Treleasei, 10.
verrucosa, 5.
vinifera, 28.
Virginiana, 15.
vulpina, 5, 9.



2695. Grape flowers, enlarged.

1, shows the bud; 2, shows the petals or "cap" falling; 3, shows the flower in full bloom, the petals having been cast off. In all the flowers the minute calyx is seen, and in 2 and 3 the disk is shown inside the base of the stamens.

The structure of the key to the following species, when standing alone, is as follows:

A *Species grown wholly for ornament: Old World*	(Nos. 1–4)
B. *Lvs. simple, cissus-like*	(No. 1)
BB. *Lvs. simple, vitis-like*	(No. 2)
BBB. *Lvs. with 3–5 lfts*	(Nos. 3, 4)
AA. *Species grown primarily for their pomological interest: all New World except No. 28*	(Nos. 5–28)
B. *Skin separating from the pulp*	(Nos. 5–27)
C. *Bark not shredding*	(Nos. 5, 6)
CC *Bark shredding*	(Nos. 7–27)
D. *Green-leaved Grapes*	(Nos. 7–19)
E. *Vulpina-like*	(Nos. 7–13)
F. *Lvs. broader than long*	(No. 7)
FF. *Lvs. ovate*	(Nos. 8–13)
G. *Diaphragms thin*	(Nos. 8–12)
GG. *Diaphragms very thick*	(No. 13)
EE. *Cordifolia-like*	(Nos. 14–18)
F. *Plant strong and climbing.*	(Nos. 14–17)
G. *Young shoots terete*	(No. 14)
GG. *Young shoots angled*	(Nos. 15–17)
FF. *Plant scarcely climbing*	(No. 18)
EEE. *Orbicular-scallop-leaved species*	(No. 19)
DD. *Colored-leaved Grapes*	(Nos. 20–27)
E. *Mature lvs. only flocculent or cobwebby or glaucous beneath*	(Nos. 20–24)
F. *Ends of growing shoots white-tipped*	(Nos. 20, 21)
FF. *Ends of shoots rusty-tipped.*	(Nos. 22–24)
EE. *Mature lvs. densely tomentose beneath*	(Nos. 25–27)
F. *Tendrils intermittent*	(Nos. 25, 26)
FF. *Tendrils continuous (at every joint)*	(No. 27)
BB. *Skin and pulp firmly cohering*	(No. 28)

A. *Species grown wholly for ornament, recently introduced from various parts of the Old World.*

B. *Lvs. simple, cissus-like.*

1. **antárctica,** Benth. (*Cissus antárctica*, Vent. *Vitis Baudiniàna*, F. Muell. *Cissus Baudiniàna*, Brouss.). Vigorous tall woody climber, the young growths red-hairy or sometimes glabrous: lvs. ovate to oblong, on hairy petioles, toothed, glandular in the axils of veins beneath: fls. greenish, tomentose, in short cymes, the petals 4 and falling separately: berry globular. Australia. B.M. 2488.—Offered in southern California and said to be suitable for covering rocks and walls.

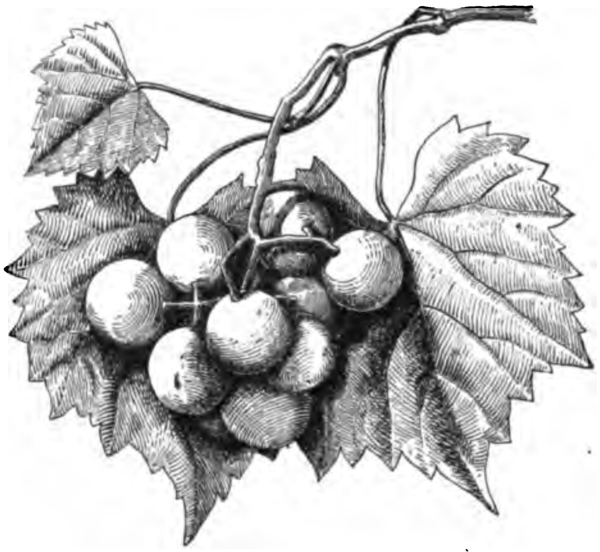
BB. *Lvs. simple, often lobed, vitis-like.*

2. **Coignétiæ,** Pulliat. Very strong-growing vine, covering trees and arbors with a thatch of heavy showy foliage: branches floccose-tomentose when young: tendrils intermittent: lvs. cordate-orbicular, with 3–5 lobe-like points, the margins shallowly apiculate-toothed, dull above, thickly gray-pubescent beneath: thyrse stalked, short: fr. globular, about ⅓ in. in diam., practically inedible, although said to be eaten after being frozen by the Japanese. N. Japan. Gn. 49, p. 48; 50, p. 449. R.H. 1898, p. 426–28.—One of the best of all strong-growing vines, and hardy in the northern states. Its foliage becomes brilliant scarlet in the fall, whence it has been called the "Crimson Glory Vine." In general appearance it much resembles *Vitis Labrusca*. It is not yet well known. It grows readily from imported seeds. It can also be propagated by layering and by grafting on other stocks. Named for Mme. Coignet, of Lyons, France.

BBB. *Lvs. with 3–5 leaflets.*

3. **hypoglaùca,** F. Muell. (*Cissus hypoglaùca*, Gray). Foliage handsome and persistent, dark green above and glaucous beneath; leaflets usually 5, obovate to elliptic, acuminate, stalked, entire or toothed towards the apex: fls. yellowish: fr. rather small and nearly globular. Australia.—Offered in S. Calif.

4. **pteróphora,** Baker (*V. gongylòdes*, Lynch, not Baker). A most remarkable species, the branches bearing cylindrical or club-shaped tubers at their ends, which fall and produce new plants: tall, climbing by means of long forking disciferous tendrils, the stem winged and hairy: lvs. large, of 3 lfts., which may be again lobed, the stipules large and purple on one side, the petiole winged: cyme pedunculate: floral envelopes of a thickened calyx and 4 minute petals. Brazil. G.C. II. 19:53. B.M. 6803. Gn. 55, p. 170.—Offered in S. Calif.



2696. Vitis rotundifolia, the Muscadine grape of the South (× ⅓).

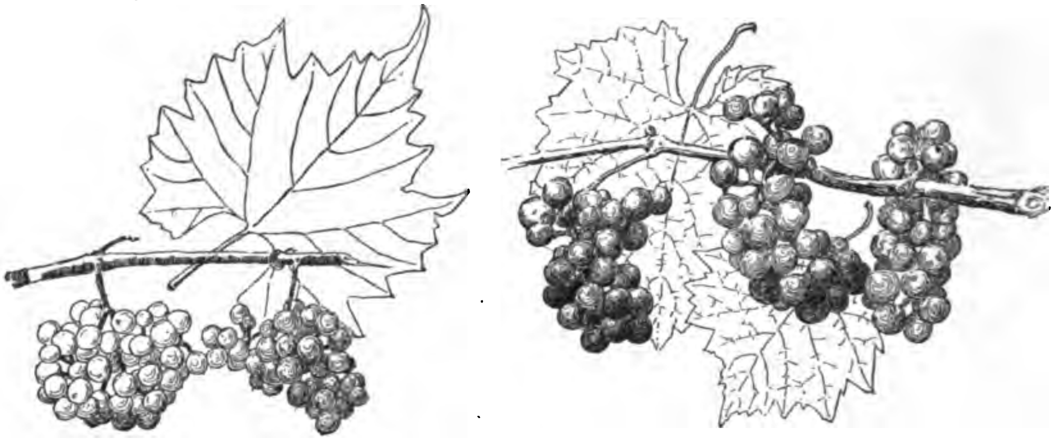
AA. *Species grown primarily for their pomological (fruit) interest, all native except No. 28.*

B. *Skin of the mature berry usually separating freely from the pulp (Nos. 5-27).*

C. *Bark bearing prominent lenticels, never shredding: nodes without diaphragms: tendrils simple: flower-clusters small and not much elongated: seeds oval or oblong, without a distinct stipe-like beak. (Muscadinia.)*

5. **rotundifòlia,** Michx. (*V. taurìna*, Bartram. *V. vulpìna*, Authors, not Linn. *V. muscadìna, angulàta, verrucòsa, peltàta, Floridàna*, Raf.). Muscadine, Southern Fox Grape, Bullace or Bullit or Bull Grape. Fig. 2696. Vine with hard, warty wood, running rampantly even 60 to 100 ft. over bushes and trees, and in the shade often sending down dichotomous aërial roots: lvs. rather small to medium (2 to 6 in. long), dense in texture and glabrous both sides (sometimes pubescent along the veins beneath), cordate-ovate and not lobed, mostly with a prominent and sometimes an acuminate point (but somewhat contracted above the termination of the two main side veins), the under surface finely reticulated between the veins, the teeth and the apex angular, coarse and acute, the basal sinus shallow, broad and edentate; petiole slender and (like the young growth) fine-scurfy, about the length of the leaf-blade: tendrils (or flower-clusters) discontinuous, every third node being bare: fruit-bearing clusters smaller than the sterile ones, and ripening from 3 to 20 grapes in a nearly globular bunch: berries falling from the clusters when ripe, spherical or nearly so and large (⅔–1 in. in diameter), with very thick and tough skin and a tough musky flesh, dull purple in color without bloom (in the Scuppernong variety silvery amber-green), ripe in summer and early autumn: seeds ¼–⅜ in. long, shaped something like a coffee berry. River banks, swamps, and rich woodlands and thickets, S. Delaware to N. Fla. and west to Kans. and Texas.

6. **Munsoniàna**, Simpson. Mustang Grape of Florida. Bird or Everbearing Grape. Very slender grower, preferring to run on the ground or over low bushes, more nearly evergreen than the last, flowering more or less continuously: lvs. smaller, thinner, and more shining, more nearly circular in outline and less prominently pointed, the teeth broader in proportion to the blade and more open or spreading: clusters larger and more thyrse-like: berries a half smaller than in the last and often more numerous, shining black, with a more tender pulp, acid juice, no muskiness, and thinner skin: seeds half smaller than in the last. Dry woods and sands, Florida, at Jacksonville, Lake City, and southwards, apparently the only Grape on the reef keys; also in the Bahamas.—Difficult to distinguish from *V. rotundifolia* in herbarium specimens, but distinct in the field.



2697. Vitis monticola (on the left) and V. vulpina (× ⅓).

CC. *Bark without distinct lenticels, on the old wood separating in long thin strips and fibers: nodes provided with diaphragms: tendrils forked: flower-clusters mostly large and elongated: seeds pyriform. (Euvitis.)*

D. *Green-leaved Grapes, mostly marked at maturity by absence of prominent white, rusty, or blue tomentum or scurf or conspicuous bloom on the lvs. beneath (under surface sometimes thinly pubescent, or minute patches of floccose wool in the axils of the veins, or perhaps even cobwebby): foliage mostly thin: tendrils intermittent, i. e., every third joint bearing no tendrils (or inflorescence). V. cinerea and V. Arizonica are partial exceptions and might be looked for in* DD *(Nos. 7–19).*

E. *Vulpina-like Grapes, characterized by thin light or bright green mostly glossy lvs. (which are generally glabrous below at maturity except perhaps in the axils of the veins and in V. Champini), with a long or at least a prominent point and usually long and large sharp teeth or the edges even jagged (Nos. 7–13).*

F. *Lvs. broader than long, with truncate-oblique base. (V. Treleasei might be sought here.)*

7. **rupéstris**, Scheele. Sand, Sugar, Rock, Bush, or Mountain Grape. Shrub, 2 to 6 ft. high, or sometimes slightly climbing, the tendrils few or even none, diaphragms plane and rather thin: lvs. reniform to reniform-ovate (about 3 to 4 in. wide and two-thirds as long), rather thick, smooth and glabrous on both surfaces at maturity, marked by a characteristic light glaucescent tint, the sides turned up so as to expose much of the under surface, the base only rarely cut into a well-marked sinus, the margins very coarsely angle-toothed, the boldly rounded top bearing a short, abrupt point and sometimes 2 lateral teeth enlarged and suggesting lobes: stamens in fertile fls. recurved laterally or rarely ascending, those in the sterile fls. ascending: cluster small, slender, open and branched: berries small (¼–⅓ in. in diam.), purple-black and somewhat glaucous, pleasant-tasted, ripe in late summer: seeds small and broad. Sandy banks, low hills and mountains, District of Columbia and S. Pa. to Tenn., Indiana, Mo., and S. W. Texas.

Var. **dissécta**, Eggert, is a form with more ovate lvs. and very long teeth, and a strong tendency towards irregular lobing. Mo.

FF. *Lvs. ovate in outline, with a mostly well-marked sinus.*

G. *Diaphragms (in the nodes) thin: young shoots not red: lvs. not deeply lobed.*

8. **monticola**, Buckley (*V. Texàna*, Munson. *V. Foexeàna*, Planch). Sweet Mountain Grape. Fig. 2697. A slender trailing or climbing plant (reaching 20 to 30 ft. in height, with very long and slender branches, the young growth angled and floccose (sometimes glabrous), the diaphragms plane and rather thin: lvs. small and thin (rarely reaching 4 in. in width and generally from 2 to 3 in. high), cordate-ovate to triangular-ovate, with the basal sinus ranging from nearly truncate-oblique to normally inverted U-shaped, rather dark green but glossy above and grayish green below, when young more or less pubescent or even arachnoid below, the blade either prominently notched on either upper margin or almost lobed, the point acute and often prolonged, margins irregularly notched with smaller teeth than in *V. rupestris:* clusters short and broad, much branched: berries medium or small (averaging about ⅓ in. in diam.), black or light-colored, seedy, sweet: seeds large (about ¼ in. long) and broad. Limestone hills in S. W. Texas.—This species has been the subject of much misunderstanding.

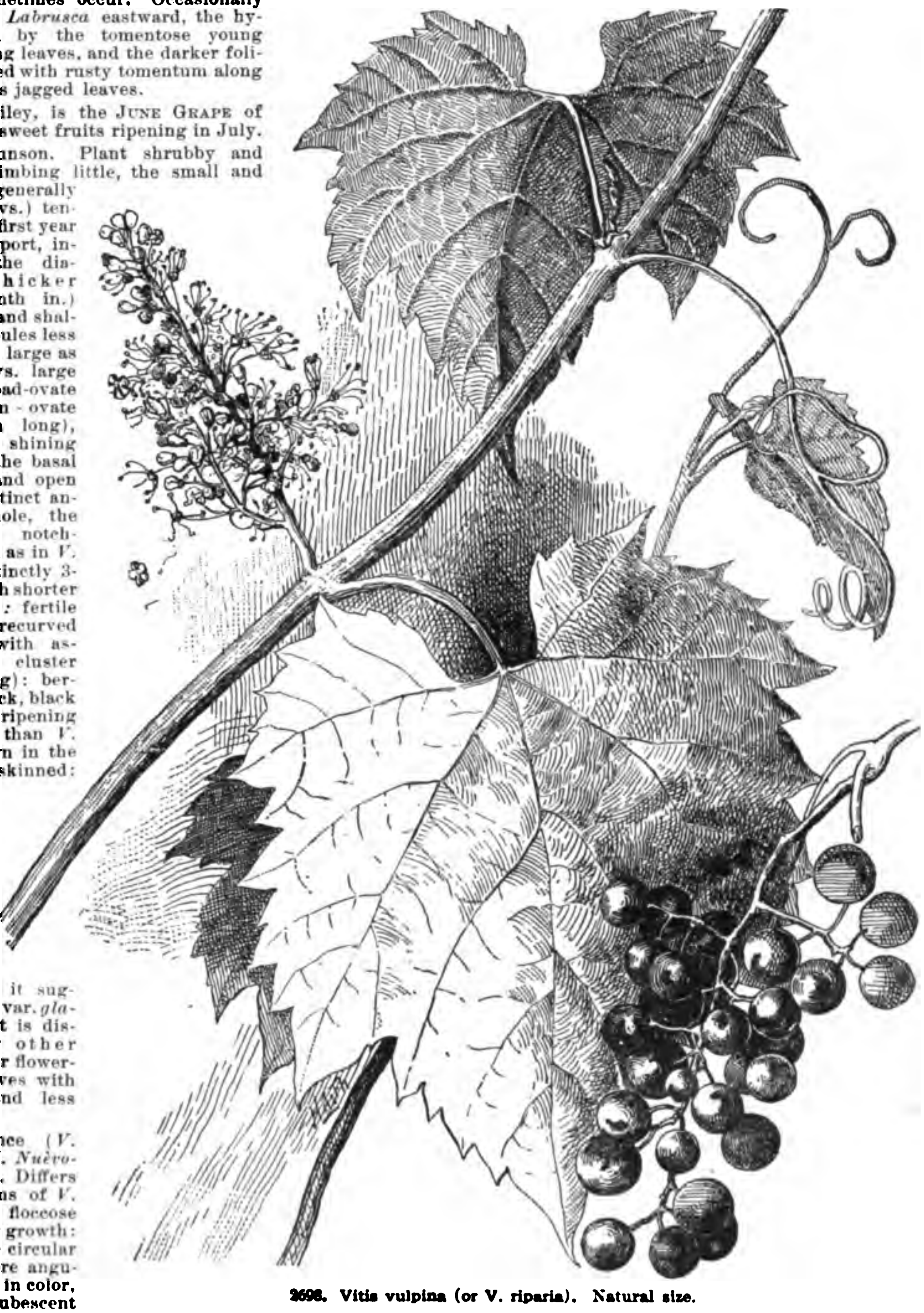
9. **vulpina**, Linn. (*V. ripària*, Michx. *V. odoratíssima*, Donn. *V. Illinoénsis* and *V. Missouriénsis*, Prince? *V. tenuifòlia*, Le Conte? *V. cordifòlia*, var. *ripària*, Gray). Riverbank or Frost Grape. Figs. 2697, 2698. A vigorous tall-climbing plant, with a bright green cast to the foliage, normally glabrous young shoots, large stipules, and plane very thin diaphragms: lvs. thin, medium to large, cordate-ovate, with a broad but usually an evident sinus, mostly showing a tendency (which is sometimes pronounced) to 3 lobes, generally glabrous and bright green below, but the veins and their angles often pubescent, the margins variously deeply and irregularly toothed and sometimes cut, the teeth and the long point prominently acute: fertile fls. bearing reclining or curved stamens, and the sterile ones long and erect or ascending stamens: clusters medium to large, on short peduncles, branched (often very compound), the fls. sweet-scented: berries small (less than ½ in. in diam.). purple-black with a heavy blue bloom, sour and usually austere, generally ripening late (even after frost): seeds rather small and distinctly pyriform. New Brunswick, according to

Macoun, to N. Dak., Kans. and Colo. and south to W. Va., Mo. and N.W.Texas. B.M 2429.—The commonest Grape in the northern states west of New England, abundant along streams. Variable in the flavor and maturity of the fruit. Forms with petioles and under surfaces of lvs. pubescent sometimes occur. Occasionally hybridizes with *V. Labrusca* eastward, the hybrid being known by the tomentose young shoots and unfolding leaves, and the darker foliage, which is marked with rusty tomentum along the veins of the less jagged leaves.

Var. **prǽcox,** Bailey, is the JUNE GRAPE of Missouri, the little sweet fruits ripening in July.

10. **Treleàsei,** Munson. Plant shrubby and much branched, climbing little, the small and mostly short (generally shorter than the lvs.) tendrils deciduous the first year unless finding support, internodes short, the diaphragms twice thicker (about one-sixteenth in.) than in *V. vulpina* and shallow-biconcave: stipules less than one-fourth as large as in *V. vulpina:* lvs. large and green, very broad-ovate or even reniform-ovate (often wider than long), thin glabrous and shining on both surfaces, the basal sinus very broad and open and making no distinct angle with the petiole, the margin unequally notch-toothed (not jagged as in *V. vulpina*) and indistinctly 3-lobed, the apex much shorter than in *V. vulpina:* fertile fls. with very short, recurved stamens, sterile with ascending stamens: cluster small (2 to 3 in. long): berries ⅓ in. or less thick, black with a thin bloom, ripening three weeks later than *V. vulpina* when grown in the same place, thin-skinned: pulp juicy and sweet: seeds small. Brewster county, S. W. Texas and New Mexico to Bradshaw Mountains, Arizona. — Little known, and possibly a dry-country form of *V. vulpina*. In habit it suggests *V. Arizonica*, var. *glabra*, from which it is distinguished, among other things, by its earlier flowering and larger leaves with coarser teeth and less pointed apex.

11. **Lóngii,** Prince (*V. Solònis*, Planch. *V. Nuèvo-Mexicàna*, Lemm.). Differs from vigorous forms of *V. vulpina* in having floccose or pubescent young growth: lvs. decidedly more circular in outline, with more angular teeth and duller in color, often distinctly pubescent beneath: stamens in fertile fls. short and weak and laterally reflexed, those in sterile fls. long and strong: seeds larger. N.W.Texas and New Mexico.—Regarded by French authors as a hybrid, the species *V. rupestris*, *vulpina*, *candicans* and *cordifolia* having been suggested as its probable parents. It is variable in character. In most of its forms it would be taken for a compound of *V. rupestris* and *V. vulpina*, but the latter species is not known to occur in most of its range. It was very likely originally a hybrid between *V. rupestris* (which it sometimes closely resembles in herbarium specimens except for its woolliness) and some tomentose



2698. Vitis vulpina (or V. riparia). Natural size.
Probably the most widespread of American native grapes.

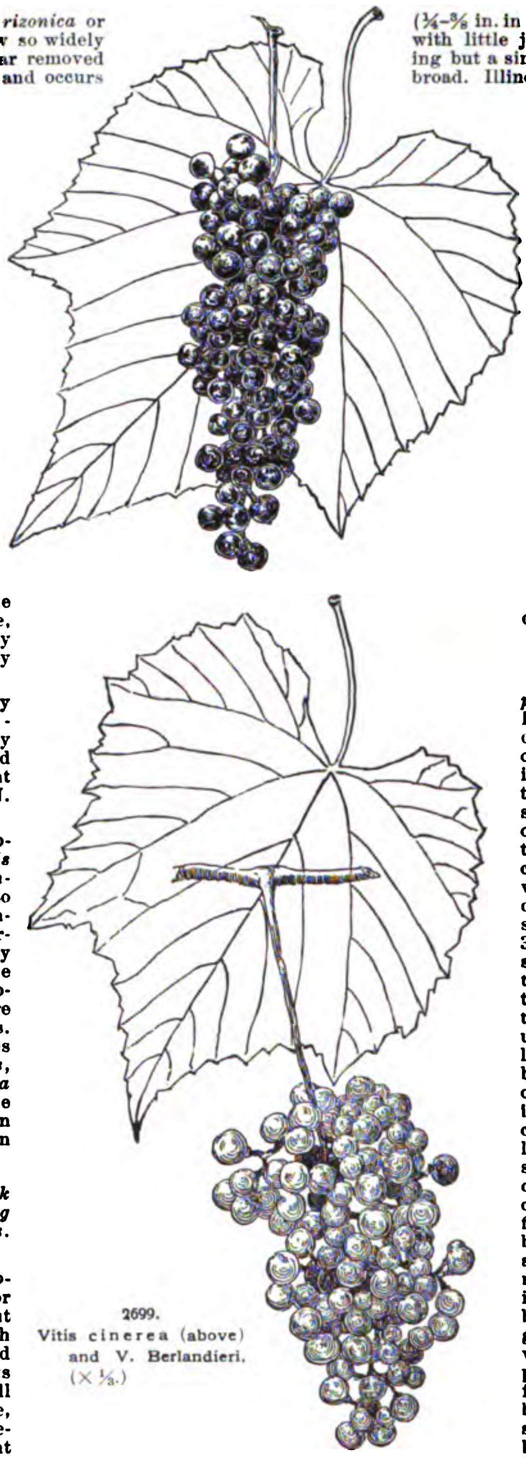
species (possibly with *V. Arizonica* or *V. Doaniana*), but it is now so widely distributed and grows so far removed from its supposed parents and occurs in such great quantity in certain areas, that for taxonomic purposes it must be kept distinct. It is not unlikely that it has originated at different places as the product of unlike hybridizations. Late French writers designate the jagged leaved forms as *V. Solonis*, and the dentate forms as *V. Nuevo-Mexicana*. This interesting Grape was found some thirty years ago by Engelmann in the Botanic Garden of Berlin under the name of *Vitis Solonis*, without history. Engelmann guesses (Bushberg Cat. ed. 3, 18) the name to be a corruption of "Long's." It is probable that the plant was sent to European gardens as *Vitis Longii*—very likely from Prince's nursery—and the name was misread on the label. The original name, which was duly published by Prince with description, may now be restored.

Var. **microspérma**, Bailey (*V. Solonis*, var. *microspérma*, Munson), is a very vigorous and small-seeded form, which is very resistant to drought. Red River, N. Texas.

12. **Chámpini**, Planch. Probably a hybrid of *V. rupestris* or *V. Berlandieri* and *V. candicans*, bearing medium to large reniform or reniform-cordate lvs. which are variously pubescent or cobwebby but become glabrous, the growing tips mostly white-tomentose: berries very large and excellent. S. W. Texas. A.G. 1891:579.—In some places associated with *V. candicans*, *Berlandieri* and *monticola* only, and in others with the above and *V. rupestris*. Often composing dense thickets in the wild.

GG. *Diaphragms very thick and strong: young shoots bright red: lvs. often strongly lobed.*

13. **rùbra**, Michx. (*V. monospérma*, Michx.). Red or Cat Grape. A slender but strong-growing vine, with small, long-jointed angled red glabrous herb-like shoots and red petioles: lvs. small to medium, ovate-acuminate, dark green and glossy, sometimes indistinctly pubescent on the nerves below, the sinus obtuse, the blade either nearly continuous in outline or (commonly) prominently lobed or even parted, coarsely notched: stamens in the sterile fls. long and erect: clusters loose and long-peduncled, branched, the fls. opening very late: berries small and late (¼-⅜ in. in diam.), black without bloom, with little juice and commonly containing but a single seed, which is large and broad. Illinois and Missouri to Louisiana and Texas. G.F. 2:341.—A handsome plant. *V. palmata*, Vahl, founded on Virginian specimens, is probably *V. vulpina*, although it is sometimes made to replace the name *V. rubra*.



2699. Vitis cinerea (above) and V. Berlandieri. (× ⅓.)

EE. *Cordifolia-like Grapes, with thickish and dull-colored or grayish green lvs. often holding some close, dull pubescence below at maturity and the shoots and lvs. nearly always more or less pubescent when young, the teeth mostly short, the point mostly rectangular and conspicuous (Nos. 14-18).*

F. *Plant strong and climbing, with stout, persistent tendrils.*

G. *Young shoots terete, and glabrous or very soon becoming so.*

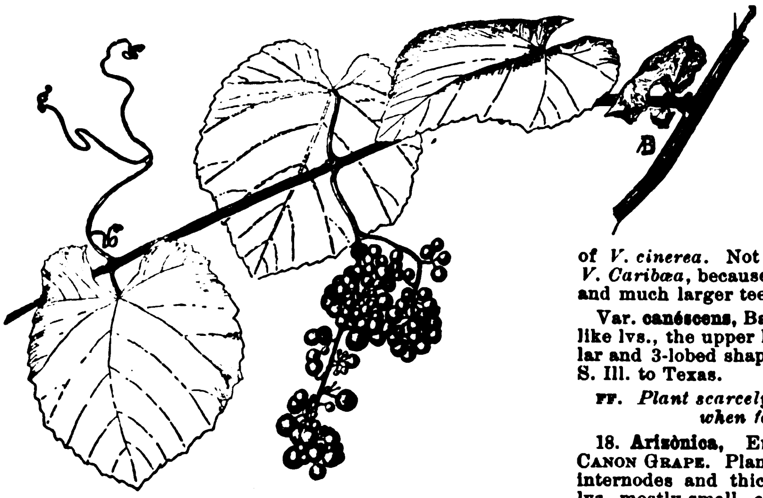
14. **cordifòlia**, Michx. (*V. pullària*, LeConte). True Frost Grape, Chicken, Raccoon, or Winter Grape. One of the most vigorous of American vines, climbing to the tops of the tallest trees, and sometimes making a trunk 1 or 2 ft. in diam.: diaphragms thick and strong: lvs. long-cordate, triangular-cordate with rounded base, or cordate-ovate, undivided but sometimes very indistinctly 3-lobed or 3-angled, the basal sinus rather deep and narrow, the margin with large, acute teeth of different sizes and the point long and acute, the upper surface glossy and the lower bright green and either becoming perfectly glabrous or bearing some close and fine inconspicuous grayish pubescence on the veins; petioles long: stamens erect in the sterile fls. and short reflexed-curved in the fertile ones: clusters long and very many-flowered, most of the pedicels branched or at least bearing a cluster of fls.: berries numerous and small (about ⅜in. in diam.), in a loose bunch, black and only very slightly glaucous, late and persistent, with a thick skin and little pulp, becoming edible after frost: seeds medium and broad. In thickets and along streams from Pa. (and probably S. New York) to E. Kan., Fla. and Texas.

Var. **fœtida**, Engelm., has fetidly aromatic berries, and grows in the Mississippi valley.

Var. **sempérvirens**, Munson. A glossy-leaved form holding its foliage very late in the season: lvs. sometimes suggesting forms of *V. rubra*. S. Fla.

Var. **Hélleri**, Bailey. Lvs. more circular (i. e., lacking the long point), and the teeth round-obtuse and ending in a short mucro. Kerr county, S. Texas, 1,600 to 2,000 feet.

GG. *Young shoots angled, and covered the first year with tomentum or wool.*



2700. Vitis Californica (× one-fifth).

15. **Baileyàna**, Munson (*V. Virginiàna*, Munson, not Lam.). 'Possum Grape. Less vigorous climber than *V. cordifolia*, rather slender, with short internodes and very many short side shoots: lvs. frequently smaller, the larger ones shortly but distinctly 3-lobed (lobes mostly pointed and much spreading), bright green but not shining above, gray below and pubescent at maturity only on the veins, the point only rarely prolonged and often muticous, the teeth comparatively small and notch-like and not prominently acute, sinus more open; petioles shorter and often pubescent; floral organs very small, the stamens reflexed in the fertile fls.: pedicels short, making the bunch very compact: berries about the size of *V. cordifolia*, black and nearly or quite bloomless, late: seed small and notched on top. Mountain valleys, 800 to 3,000 ft. altitude, southwestern Va. and adjacent W. Va. and W. N. C., Tenn. and N. Ga.; also at common levels in the uplands of west-central Ga.—The eastern counterpart of *V. Berlandieri*.

16. **Berlandièri**, Planch. Mountain, Spanish, Fall or Winter Grape. Fig. 2699. A stocky, moderately climbing vine, with mostly short internodes and rather thick diaphragms: lvs. medium large, broadly cordate-ovate or cordate-orbicular (frequently as broad as long), glabrous and glossy above, covered at first with gray pubescence below but becoming glabrous and even glossy except on the veins, the sinus mostly inverted-U-shaped in outline but often acute at the point of insertion of the petiole, the margin distinctly angled above or shortly 3-lobed and marked by rather large, open, notch-like acute teeth of varying size, the apex mostly pronounced and triangular-pointed: stamens long and ascending in the sterile fls., laterally recurved in the fertile ones: clusters compact and compound, mostly strongly shouldered, bearing numerous medium to small (⅓in. or less in diam.), purple and slightly glaucous very late berries which are juicy and pleasant-tasted: seed (frequently only 1) medium to small. Limestone soils along streams and hills, S. W. Texas and Mex.—Well marked by the gray-veined under surface of the leaves.

17. **cinèrea**, Engelm. Sweet Winter Grape. Fig. 2699. Climbing high, with medium to long internodes and thick and strong diaphragms: lvs. large, broadly cordate-ovate to triangular-cordate-ovate (generally longer than broad), the sinus mostly wide and obtuse, the margin small-notched (teeth much smaller than in *V. Belandieri*) or sometimes almost entire, mostly distinctly and divaricately 3-angled or shortly 3-lobed towards the apex, the triangular apex large and prominent, the upper surface cobwebby when young but becoming dull dark green (not glossy), the under surface remaining ash-gray or dun-gray, webby-pubescent: stamens in sterile fls. long, slender and ascending, in the fertile ones short and laterally recurved: cluster mostly loose and often straggling, containing many small black berries, these only slightly, if at all glaucous, ripening very late, and after frost becoming sweet and pleasant: seeds small to medium. Along streams, mostly in limy soils, central Ill. to Kans. and Texas; also N. Fla.; also in Mex.—Readily distinguished from *V. æstivalis* by the triangular-topped sharply 3-lobed ash-gray lvs. and the gray tomentum of the young growth.

Var. **Floridàna**, Munson. Growing tips rusty-tomentose, as are sometimes the veins on the under sides of the leaves: cluster longer-peduncled and more compound. Manatee co., Fla.; and apparently also in Ark.; possibly a compound with *V. æstivalis*, but the lvs. have the characteristic shape of *V. cinerea*. Not to be confounded with any form of *V. Caribæa*, because of the lobed triangular-topped lvs. and much larger teeth.

Var. **canéscens**, Bailey. A form with rounded or heart-like lvs., the upper half of the leaf lacking the triangular and 3-lobed shape of the type. St. Louis, Mo., and S. Ill. to Texas.

FF. *Plant scarcely climbing, the tendrils perishing when failing to find support.*

18. **Arizònica**, Engelm. (*V. Arizonénsis*, Parry). Canon Grape. Plant weak, much branched, with short internodes and thick diaphragms, branchlets angled: lvs. mostly small, cordate-ovate and with a prominent triangular-pointed apex, the sinus broad or the base of the blade even truncate, the teeth many and small and pointed or mucronate, the margin either continuous or very indistinctly 3-lobed (or sometimes prominently lobed on young growths), the leaves and shoots white-woolly when young, but becoming nearly glabrous with age: stamens ascending in sterile fls. and recurved in the fertile ones: bunches small and compound, not greatly, if at all, exceeding the lvs., bearing 20 to 40 small black berries of pleasant taste: seeds 2 to 3, medium size. Along river banks, W. Texas to New Mex. and Ariz., mostly south of the 35th parallel, to S. E. Calif. and northern Mex.

Var. **glàbra**, Munson. Plant glabrous, with glossy and mostly thinner and larger lvs. In mountain gulches, with the species and ranging northwards into S. Utah. Distinguished from *V. monticola* by its triangular-pointed and small-toothed lvs. Probably a form of *V. Treleasi*.

EEE. *Orbicular-scallop-lvd. species of the Pacific coast.*

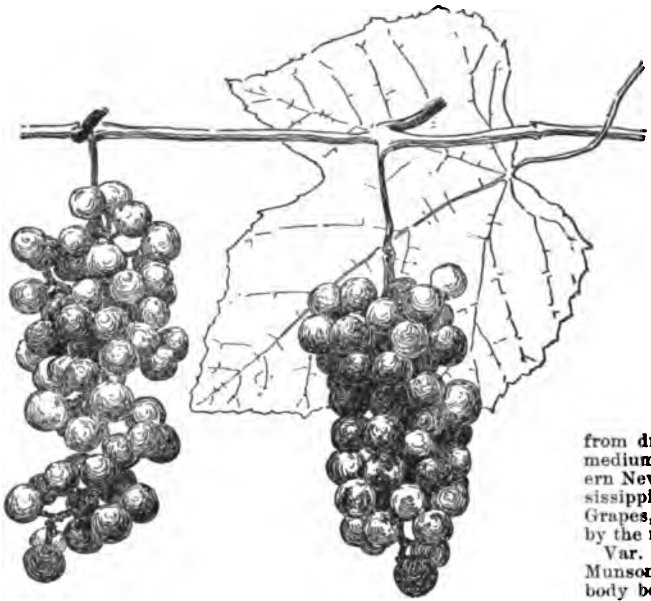
19. **Califórnica**, Benth. Fig. 2700. A vigorous species, tall-climbing upon trees but making bushy clumps when not finding support, the nodes large and diaphragms rather thin: lvs. mostly round-reniform (the broader ones the shape of a horse's hoof-print), rather thin, either glabrous and glossy or (more commonly) cottony-canescent until half grown and usually remaining plainly pubescent below, the sinus ranging from very narrow and deep to broad and open, the margins varying (on the same vine) from finely blunt-toothed to coarsely scallop-toothed (the latter a characteristic feature), the upper portion of the blade either perfectly continuous and rounded or sometimes indistinctly 3-lobed and terminating in a very short apex: bunches medium, mostly long-peduncled and forked, the numerous small berries glaucous-white, seedy and dry but of fair flavor: seed large (¼ to 5-16 in. long), prominently pyriform. Along streams in central and N. Calif. and S. Ore.—Lvs. becoming handsomely colored and mottled in fall.

DD. *Colored-leaved Grapes, marked by thick or at least firm foliage, the lvs. prominently rusty or white-tomentose or glaucous-blue. V. cinerea, V. Arizonica, and possibly V. Californica might be sought here; and late-gathered forms of V. bicolor might be looked for in* D (p. 1950).

E. *Lvs. only flocculent or cobwebby or glaucous below when fully grown* (*i. e., not covered with a thick, dense, felt-like tomentum, except sometimes in V. Doaniana*). (*Nos. 20–24.*)

F. *White-tipped Grapes, comprising species with the ends of the growing shoots and the under surface of the lvs. whitish or gray.*

20. **Girdiàna,** Munson. Valley Grape. Strong, climbing vine, with thick diaphragms: lvs. medium to large and rather thin, broadly cordate-ovate, with a rather deep and narrow sinus and nearly continuous or obscurely 3-lobed outline (sometimes markedly 3-lobed on young shoots), the teeth many and small and acute, the apex short-triangular or almost none, the under surface remaining closely ashy-tomentose: clusters large and very compound, each one dividing into three or four nearly equal sections, which are in turn shouldered and thyrse-like: berries small, black and slightly glaucous, the skin thin but tough, pulp finally becoming sweet: seeds medium in size, pyriform. S. Calif., south of the 36th parallel. —Differs from *V. Californica* in the more pubescent shoots and foliage, smaller and sharp teeth, decompound clusters, smaller less glaucous berries, and smaller seeds. Shoots of *V. Californica* often bear lvs. with small and muticous teeth, and such specimens without the fl.-clusters are difficult to distinguish from this species. Some of the forms which have been referred to *V. Girdiana* are apparently hybrids with the wine Grape, *V. vinifera;* and at best the plant is imperfectly understood and its merits as a species are yet to be determined.



2701. Vitis bicolor (× ⅓).

21. **Doaniàna,** Munson. Plant vigorous, climbing high or remaining bushy if failing to find support, with short internodes and rather thin diaphragms: lvs. bluish green in cast, mostly large, thick and firm, cordate-ovate or round-ovate in outline, bearing a prominent triangular apex, the sinus either deep or shallow, the margins with very large, angular, notch-like teeth and more or less prominent lobes, the under surface usually remaining densely pubescent and the upper surface more or less floccose: cluster medium to small, bearing large (⅝ in. and less in diam.), black, glaucous berries of excellent quality: seeds large (¼–⅜ in. long), distinctly pyriform. Chiefly in N. W. Texas, but ranging from Greer Co., Oklahoma, to beyond the Pecos river in New Mexico. G.F. 9:455.—The species varies greatly in pubescence, some specimens being very nearly glabrous at maturity and others densely white-tomentose. The plant would pass at once as a hybrid of *V. vulpina* and *V. candicans*, except that the former does not often occur in its range. It is very likely a hybrid, however, and *V. candicans* seems to be one of the parents.

FF. *Rusty-tipped Grapes, comprising the æstivalian group, the unfolding lvs. and* (*except in V. bicolor*) *the young shoots distinctly ferrugineous, and the mature lvs. either rusty or bluish below, or sometimes becoming green in V. bicolor.*

22. **æstivàlis,** Michx. (*V. sylvéstris, occidentalis* and *Americàna*, Bartram. *V. Nórtoni*, Prince. *V. Labrúsca*, var. *æstivàlis*, Regel. *V. bracteàta* and *V. araneòsus*, LeConte). Summer, Bunch, or Pigeon Grape. Strong, tall-climbing vine, with medium short internodes, thick diaphragms, and often pubescent petioles: lvs. mostly large, thinnish at first but becoming rather thick, ovate-cordate to round-cordate in outline, the sinus either deep (the basal lobes often overlapping) or broad and open, the limb always lobed or prominently angled, the lobes either 3 or 5, in the latter case the lobal sinuses usually enlarged and rounded at the extremity, the apex of the leaf broadly and often obtusely triangular, the upper surface dull and becoming glabrous and the under surface retaining a covering of copious rusty or red-brown pubescence which clings to the veins and draws together in many small, tufty masses: stamens in fertile fls. reflexed and laterally bent: clusters mostly long and long-peduncled, not greatly branched or even nearly simple (mostly interrupted when in flower), bearing small (⅓ in. or less in diam.), black, glaucous berries, which have a tough skin and a pulp ranging from dryish and astringent to juicy and sweet: seeds medium size (¼ in. or less long), two to four. Southern New York to central Fla. and westward to the Mississippi and Missouri.—A marked type among American Grapes, being readily distinguished from other species by the reddish fuzz of the under sides of the leaves.

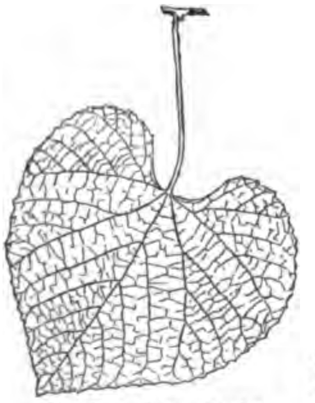
Var. **glaùca,** Bailey (*V. Línceeumii*, var. *glaùca*, Munson). Lvs. and mature wood glaucous-blue on the body beneath, but the veins rusty: berries and seeds larger. S. W. Missouri to N. Texas.—Much like *V. bicolor*, but lvs. thicker and more pubescent below, and tips of shoots rusty-tomentose.

Var. **Línsecomii,** Munson (*V. diversifòlia*, Prince. *V. Línsecomii*, Buckley). Post-oak, Pine-wood, or Turkey Grape. More stocky than *V. æstivalis*, climbing high upon trees but forming a bushy clump when not finding support: lvs. densely tomentose or velvety below: berries large (⅝–¾ in. in diameter), black and glaucous, mostly palatable: seeds mostly much larger than in *V. æstivalis* (often ⅜ in. long). High post-oak (*Quercus stellata*) lands, S. W. Missouri to N. Texas and E. La.—Very likely derived from the *æstivalis* type through adaptation to dry soils and climates. Perhaps worth recognition as a geographical species. The name of this Grape was spelled Linsecomii by Buckley, with whom the name originated. The name of the person whom he commemorated was spelled Lincecum, and Munson has therefore changed the spelling of the name of the Grape. However, Buckley's spelling should persist, as a matter of nomenclatorial priority.

Var. **Bourquiniàna,** Bailey (*V. Bourquiniàna*, Munson). A domestic offshoot, represented in such cultivated varieties as Herbemont and Le Noir, differing from *V. æstivalis* in its mostly thinner leaves which (like the young shoots) are only slightly red-brown below, the pubescence mostly cinerous or dun-colored or the under surface sometimes blue-green: berries large and juicy, black or amber-colored.—A mixed type, some of it probably a direct amelioration of *V. æstivalis*, and some hybridized with the wine Grape (*V. vinifera*). Much cultivated south.

23. **bicolor**, Le Conte (*V. argentifòlia*, Munson). Blue Grape, or Summer Grape of the North. Fig. 2701. A strong, high-climbing vine, with mostly long internodes and thick diaphragms, the young growth and canes generally perfectly glabrous and mostly (but not always) glaucous-blue, tendrils and petioles very long: lvs. large, round-cordate-ovate in outline, glabrous and dull above and very heavily glaucous-blue below, but losing the bloom and becoming dull green very late in the season, those on the young growth deeply 3–5-lobed and on the older growths shallowly 3-lobed, the basal sinus running from deep to shallow, the margins mostly shallow-toothed or sinuate-toothed (at least not so prominently notch-toothed as in *V. æstivalis*): cluster mostly long and nearly simple (sometimes forked), generally with a long or prominent peduncle: the purple and densely glaucous berries of medium size (⅜in. or less in diam.), sour but pleasant-tasted when ripe (just before frost): seeds rather small. Abundant northwards along streams and on banks, there taking the place of *V. æstivalis*. Ranges from New Eng. and Ill. to the mountains of W. North Carolina and to W. Tenn.—Well distinguished from *V. æstivalis* (at least in its northern forms) by the absence of rufous tomentum, the blue-glaucous small-toothed leaves, and long petioles and tendrils. It has been misunderstood because it loses its glaucous character in the fall.

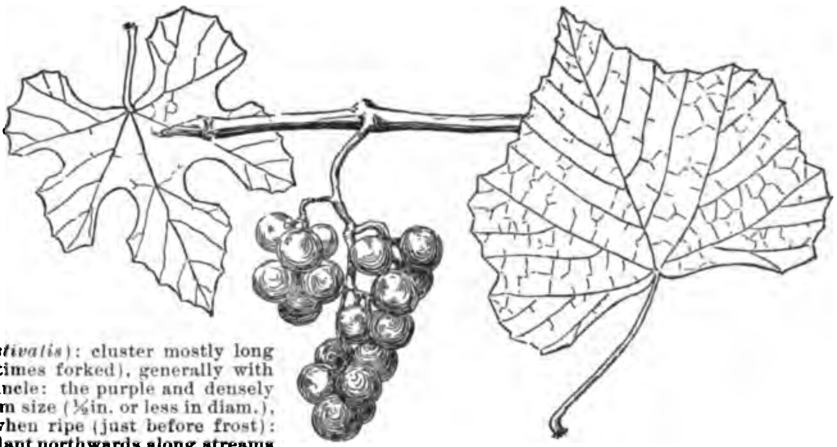
24. **Caribæa**, DC. Fig. 2702. Climbing, with flocculent-woolly (or rarely almost glabrous) and striate shoots: tendrils rarely continuous: lvs. cordate-ovate or even broader and mostly acuminate-pointed, sometimes obscurely angled above (but never lobed except now and then on young shoots), becoming glabrous above but generally remaining rufous-tomentose below, the margins set with very small, mucro-tipped sinuate teeth: cluster long and long-peduncled, generally large and very compound: berry small and globose, purple: seed obovate, grooved on the dorsal side. A widely distributed and variable species in the American tropics, running into white-leaved forms (as in *V. Blancoi*, Munson). Little known in the United States: La., Lake City, N. Fla., swamp near Jacksonville, Fla.


2702. Vitis Caribæa (× ¼).

ee. *Lvs. densely tomentose or felt-like beneath throughout the season, the covering white or rusty white.*

f. *Tendrils intermittent (every third joint with neither tendril nor inflorescence opposite the leaf).*

25. **cándicans**, Engelm. (*V. Mustangénsis*, Buckl.). Mustang Grape. Plant strong and high climbing, with densely woolly young growth (which is generally rusty-tipped), and very thick diaphragms: lvs. medium in size and more or less poplar-like, ranging from reniform-ovate to cordate-ovate or triangular-ovate, dull above but very densely white-tomentose below and on the petioles, the basal sinus very broad and open or usually none whatever (the base of the leaf then nearly truncate), deeply 5–7-lobed (with enlarging rounded sinuses) on the strong shoots and more or less indistinctly lobed or only angled on the normal growths, the margins wavy or sinuate-toothed: stamens in the sterile fls. long and strong, those in the fertile fls. very short and laterally reflexed: cluster small, mostly branched, bearing a dozen to twenty large (¾ in. or less in diam.) purple or light-colored or even whitish berries, which have a thick skin and a very disagreeable fiery flavor: seeds large, pyriform. E. Texas, mostly on limestone soils.


2703. Vitis candicans, var. coriacea (× ½).

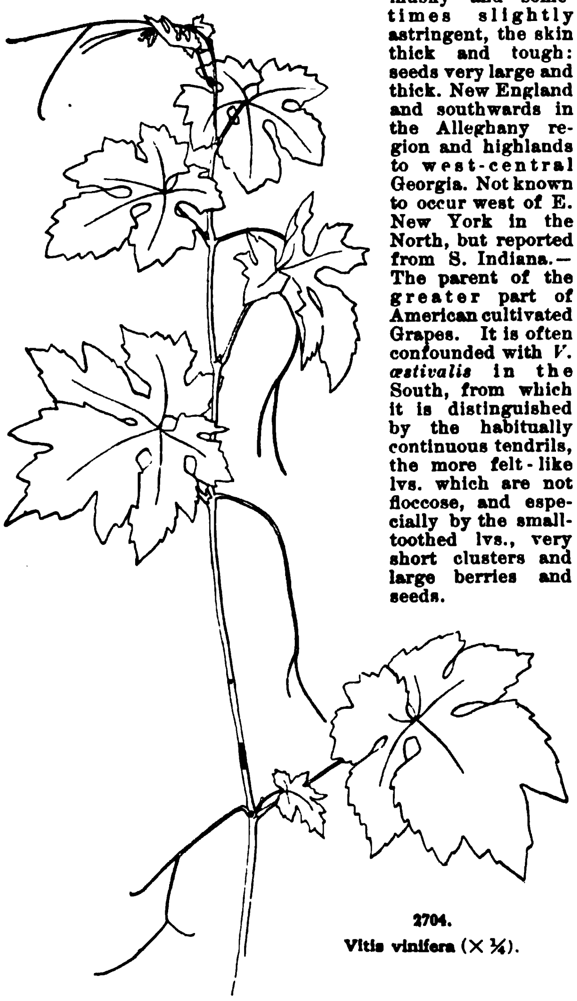
Var. **coriàcea**, Bailey (*V. coriàcea*, Shuttl.). Leatherleaf or Calloosa Grape. Fig. 2703. Differs from the species chiefly in bearing much smaller (about ⅜ in. in diam.) thinner-skinned and more edible Grapes with mostly smaller seeds, and perhaps a less tendency to very deep lobing in the lvs. on young shoots and possibly rather more marked rustiness on the young growths. Florida, chiefly southward, in which range various Texan plants reappear.—The more agreeable quality of the fr. is probably the result of a more equable and moister climate.

26. **Simpsoni**, Munson. Distinguished by mostly much-cut lvs. on the young shoots and comparatively thin, large and large-toothed ones on the main shoots, rusty-white tomentum below and very prominently brown-tomentose young growths,—the character of the lvs. and tomentum varying widely, the foliage sometimes becoming almost blue-green below. Fla.—This is likely a hybrid of *V. æstivalis* and *V. candicans*, var. *coriacea*. Some forms of it are very like *V. Labrusca*, and might be mistaken for that species.

ff. *Tendrils mostly continuous (a tendril or inflorescence at every node).*

27. **Labrúsca**, Linn. (*V. Blándi*, Prince). Fox Grape. Skunk Grape. Figs. 949, 950, Vol. II. A strong vine, climbing high on thickets and trees: young shoots tawny or fuscous, with much scurfy down: lvs. large and thick, strongly veined (especially beneath), broadly cordate-ovate, mostly obscurely 3-lobed towards the top (on strong growths the sinuses sometimes extending a third or even half the depth of the blade, and rounded and edentate at the bottom) or sometimes nearly continuous in outline and almost deltoid-ovate, the petiolar sinus mostly shallow and very open (ranging to narrow and half or more the length of the petiole), the margins shallowly scallop-toothed with mucro-pointed teeth (or sometimes almost entire), and the apex and lobes acute, the upper surface dull green and becoming glabrous but the lower surface densely covered with a tawny-white, dun-colored or red-brown tomentum: stamens long and erect in the sterile fls. and (in wild forms) short and recurved in the fertile ones: raceme short (berries usually less than 20 in wild types), generally

simple or very nearly so, in anthesis about the length of the peduncle: berries large and nearly spherical, ranging from purple-black (the common color) to red-brown and amber-green, generally falling from the pedicel when ripe, variable in taste but mostly sweetish musky and sometimes slightly astringent, the skin thick and tough: seeds very large and thick. New England and southwards in the Alleghany region and highlands to west-central Georgia. Not known to occur west of E. New York in the North, but reported from S. Indiana.—The parent of the greater part of American cultivated Grapes. It is often confounded with *V. æstivalis* in the South, from which it is distinguished by the habitually continuous tendrils, the more felt-like lvs. which are not floccose, and especially by the small-toothed lvs., very short clusters and large berries and seeds.



2704. Vitis vinifera (X ¼).

BB. *Skin and pulp firmly cohering in the ripe fruit.*

28. **vinifera**, Linn. WINE GRAPE. EUROPEAN GRAPE. Fig. 2704. Young growth smooth or floccose, the plant not so high climbing as most American species: tendrils intermittent: lvs. mostly thinnish, rounded, with a deep sinus and the basal lobes usually overlapping, tomentose or glabrous beneath, the margins coarsely notched or jagged: clusters large and long, the berries usually oval or oblong, although many varieties are globular-fruited. Probably native to the Caspian or Caucasus region and western India. Var. **laciniòsa**, Hort., has much-cut foliage; handsome. Gn. 54, p. 425.—Cult. from the earliest times, and the Grape of history. Now greatly varied. The hothouse Grapes, as Black Hamburg, Barbarossa, are of this species; also the vineyard Grapes of California. Not hardy in the northern states and very subject to phylloxera (root-louse) and mildew. Regel, a Russian botanist, considered the Wine Grape to be a hybrid of two species that he characterized as *V. Labrusca* and *V. vulpina*, but this view is not accepted.

V. Amurénsis, Rupr., is much like V. vinifera, sometimes grown abroad for the purple tint of its young growth. Gn. 54, p. 425.—*V. Bàinesii*, Hook. (Cissus Bainesii, Planch., and by him referred to C. Currori). A most remarkable species, the trunk being condensed into a turnip-like body a few inches in diam.: lvs. mostly compound, the 3 lfts. dentate, lvs. all borne on short, succulent branches: tendrils none: fls. greenish, in clusters usually raised above the leaves. S. Afr. B.M. 5472.—*V. heterophýlla*, Thunb.=Ampelopsis heterophylla.—*V. incónstans*, Miq.=Ampelopsis tricuspidata.—*V. Japónica*, Thunb. See Cissus Japonica.—*V. lanàta*, Roxbg. Vigorous species with large, cordate-ovate lvs., with small apiculate teeth and very white-tomentose beneath. China. Assumes handsome color in fall.—V. *Líndeni*, Hort. See Cissus Lindeni.—*V. Pagnúccii*, Romanet (Ampelopsis Davidiana, Mott. Ampelovitis Davidiana, Carr. Vitis Davidiana, Hort. in part !). Climbing: tendrils intermittent: lvs. mostly small, very various, sometimes 3–5-foliolate but usually only 3-lobed or even ovate-cordate and the margin nearly or quite continuous, the edges mucronate-dentate, whitish beneath. China. Has much the aspect of an Ampelopsis.—*V. Romanéti*, Romanet (Spinovitis Davidii, Carr.! Ampelovitis intermedia, Carr. Vitis Davidiana, Hort. in part !). Stems very hairy or almost spiny, the hairs glandular and purplish: tendrils intermittent: lvs. large, cordate-orbicular, shallowly 3-lobed, strongly crenate-dentate, becoming nearly or quite glabrous above, hairy beneath: clusters 3–4 in. long, the berries black, small, edible. Vigorous vine from China, little known in this country and its hardiness in the northern states not yet tested. R.H. 1885, p. 55. 1891:232 (variegated form said to belong to this species). Apparently closely allied to V Coignetiæ, from which the hairiness distinguishes it.—*V. rùtilans*, Carr., R.H. 1890:444, belongs with V. Romaneti.—*V. serjanæfòlia*, Maxim., is Ampelopsis serjanæfolia. Gn. 54, p. 427.—*V. stridta*, Miq., see Cissus striata.—*V. Thùnbergii*, Regel, is V. Amurensis.—*V. tricuspidàta*, Lynch=Ampelopsis tricuspidata.

L. H. B.

VITTADÍNIA (Dr. C. Vittadini, an Austrian who wrote on fungi 1826–1842). *Compósitæ*. About 14 species of perennial plants, natives of Australia, New Zealand, S. Amer. and Hawaiian Islands. Herbs, with a thick caudex, or branching subshrubs: lvs. alternate, entire or variously cut: heads rather small, with a yellow disk and white or blue rays, terminal, solitary or in loose, leafy corymbs: involucre of several rows: rays pistillate, numerous, crowded, in more than one row: akenes narrow, compressed or flat, with or without ribs on the faces: pappus of numerous, often unequal capillary bristles. The genus is closely related to Erigeron, differing in habit and in the appendages of the style-branches, those of Erigeron being short, while those of Vittadinia are awl-shaped.

Vittadinia triloba of the California trade is said by Dr. Franceschi, of Santa Barbara, to be "a charming dwarf plant, well suited for rockeries, borders and hanging baskets; covered with myriads of daisy-like white flowers." However, *V. triloba* of the trade is not *V. triloba* of the botanists; the latter is a synonym of *V. australis*, of which a description taken from Flora Australiensis is here given for comparison. The plant known to the California trade as *V. triloba* has been examined by J. Burtt Davy, who sends the following account: "*V. triloba*, Hort., not DC., the MEXICAN DAISY, is really an Erigeron and should be known as **Erigeron mucronàtus**, DC. Fig. 2705. It is a much-branched perennial, 6–12 in. high: lvs. alternate, variable, ¼–1 in. long, from linear-subulate or lanceolate to obovate or oblanceolate-cuneate, entire, toothed, or 3–several lobed: peduncles 1–2 in. long, solitary: heads daisy-like, about ⅜ in. diam.; rays numerous, narrow, white above, purple on the back, especially in age; style-tips obtuse. A useful border-plant, looking best in a mass or as an edging; drought-resistant, hardy and becoming naturalized near San Francisco; readily propagated by cuttings. The freshly broken stems smell strongly of Prussic acid. Fls. July–Sept."

austràlis, A. Rich. (*V. triloba*, DC., not Hort.). Herbaceous plant of uncertain duration, 1 ft. high or less, tomentose: lvs. obovate or spatulate to linear-cuneate, entire or coarsely 3-toothed or lobed: heads solitary: rays narrow: said to be revolute (which may apply only to dried specimens). Australia, Tasmania.—Has 4 distinct botanical varieties.

W. M.

VITTÀRIA (Latin, a *fillet* or *head-band*). *Polypodiàceæ*. A genus of ferns with narrow, grass-like foliage, growing pendent from trees. **V. lineàta**, Swz., is a tropical American species which is found as far north as central Florida, where it grows on the cabbage palmetto. Rare in cultivation.

L. M. UNDERWOOD.

VOLKAMÈRIA. Consult *Clerodendron.*

VRIÈSIA (named for Dr. W. de Vriese, of Amsterdam). *Bromeliàceæ.* Often spelled *Vriesea*, but not so spelled by Lindley, who founded the genus. According to Mez (DC. Monogr. Phaner. 9), 84 species are to be referred to this genus. They are very like tillandsias, with which they are united by Bentham & Hooker and others. The chief technical difference is the presence in Vriesia of 2 ligules or a single cleft or emarginate ligule on the inside of the base of petals. Culturally Vriesias are like tillandsias. They run to forms with marbled and banded leaves. They are tropical American stiff-leaved plants, with mostly distichous spikes bearing large and showy bracts. Several species have been introduced in recent years, and many garden hybrids have been produced. Few kinds are offered in the American trade, and only these kinds are described here. For other kinds, see the monographs of Baker and Mez; also the Kew List of introductions for 1876–1896. For culture, see *Tillandsia*.

A. *Stamens longer than the petals.*

B. *Inflorescence branched.*

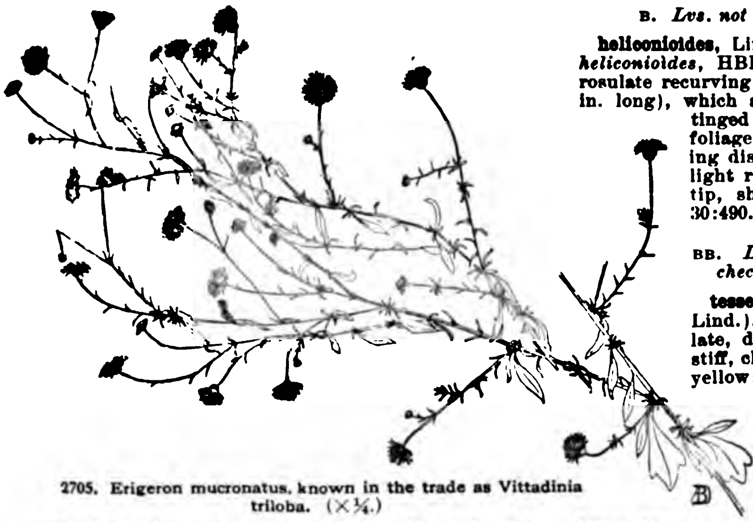
Saùndersii, Morr. (*Tillándsia Saùndersii*, C. Koch. *Encholírion Saùndersii*, André). About 1½ ft. high when in bloom: lvs. many in a rosette, rather short, strongly recurving, grayish and somewhat white-dotted above, spotted with red-brown beneath: fls. in a branched open inflorescence, sulfur-yellow, cylindrical in form. Brazil. I.H. 20:132.

BB. *Inflorescence simple.*

C. *Bracts of inflorescence strongly imbricate.*

spléndens, Lem. (*V. speciòsa*, Hook. *Tillándsia spléndens*, Brongn. *T. picta*, Hort. *T. zebrina*, Hort., in part). Fig. 2706. Strong-growing plant, with broad, strong, arching-ascending lvs. 1 ft. or more long, which are bright green and marked with dark brown transverse bands: spike with densely imbricated bright red-acuminate bracts, the scape spotted: fls. exserted, yellowish white. Guiana. B.M. 4382. F.S. 2:107; 6, p. 162. R.H. 1846:41.—One of the best and most showy species. A robust form is var. **màjor**, Hort.—See Supplementary List below for additional note on *V. zebrina*.

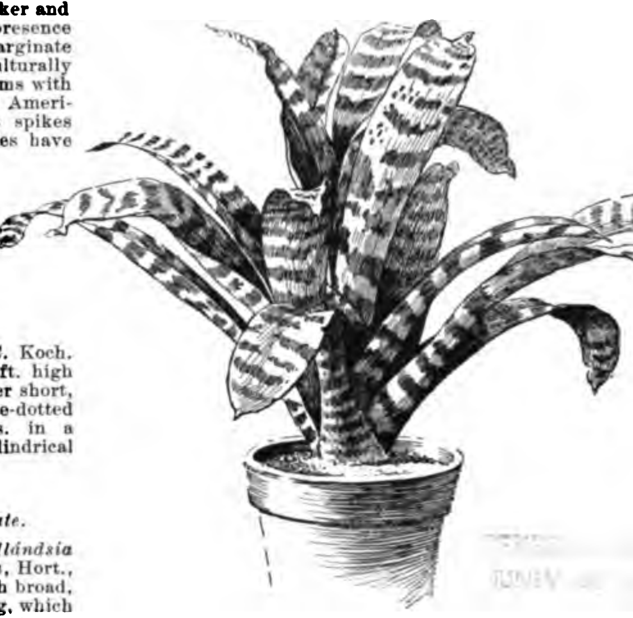
carinàta, Wawra (*V. brachýstachys*, Regel. *Tillándsia carinàta*, Baker). Fig. 2707. Lvs. rosulate, about 6 in. long, the base sheathing, mucronate at the tip, somewhat glaucous, not spotted: spike with wide-spreading nearly divaricate acuminate bracts which are scarlet at the base and yellowish green at the end: fls. protruding, pale yellow. Brazil. B.M. 6014.



2705. Erigeron mucronatus, known in the trade as Vittadinia triloba. (×¼.)

CC. *Bracts of inflorescence remote, not imbricate.*

guttàta, Lind. & André (*Tillándsia guttàta*, Baker). Lvs. rosulate, erect-arching, short and rather broad, mucronate, olive-green with irregular spots of brown-purple: bracts farinose, rose-colored, the scape slender: fls. yellow. Brasil. I.H. 22:200.



2706. Vriesia splendens.

psittacìna, Lindl. (*Tillándsia psittacìna*, Hook.). About 1 ft. high when in bloom: lvs. rosulate, 6–10 in. long, dilated at the base, yellowish green: fls. large, yellow with green tips, scattered on a distichous spike, the bracts red at the base and yellow at the top. Brazil. B.R. 29:10, where the genus is founded. B.M. 2841. R.H. 1855:221.—A showy spécies when in bloom.

AA. *Stamens shorter than the petals.*

B. *Lvs. not barred, mottled or tessellated.*

heliconioìdes, Lindl. (*V. bèllula*, Hort. *Tillándsia heliconioìdes*, HBK.). Dwarf and tufted, with many rosulate recurving or arching lanceolate lvs. (about 12 in. long), which are bright green above and purple tinged beneath. Scape overtopping the foliage, simple and erect, with wide-spreading distichous boat-shaped bracts that are light red at the base and greenish at the tip, showy: fls. white. Colombia. I.H. 30:490. G.C. II. 21:140.

BB. *Lvs. tessellated (marked in small checker-work) or minutely variegated.*

tessellàta, Morr. (*Tillándsia tessellàta*, Lind.). Lvs. short and rather broad, rosulate, dilated at base, short-pointed, rather stiff, channeled, tessellated with green and yellow: inflorescence paniculate, the greenish bracts remote: fls. yellow. Brazil. I.H. 21:179. R.H. 1889, p. 573.

fenestràlis, Lind. & André (*Tillándsia fenestràlis*, Hook. f.). Robust, densely tufted, the lvs. stout (1–2 ft. long) and recurved, brown-tipped, with many dark green veins and cross veins: inflorescence a simple stout spike 1½ ft. long and bearing green-spotted bracts: fls. pale yellow. Brazil. B.M. 6898. I.H. 22:215.

BBB. *Lvs. marked with strong transverse bands.*

hieroglýphica, Morr. (*Tillándsia hieroglýphica*, Bull.). Lvs. many, rosulate, stout, recurved, short-acute, very strongly and irregularly marked and banded with dark green above and brown-purple beneath: inflorescence paniculate, the bracts broadly elliptic-ovate, the fls. yellowish. Brazil. I.H. 31:514; 42, p. 318. R.H. 1891:400.—A very striking and showy plant. Sometimes known as a Massangea.

V. fúlgida, Hort., has been catalogued in this country. It is a garden hybrid (V. incurvata × Duvali). It has short green lvs. and an exserted simple spike with distichous bright red imbricated bracts. I.H. 35:67.—*V. glaucophýlla*, Hook., is referred to Tillandsia fasciculata.—*V. musàica*, Cogn., is Guzmania, for which see Tillandsia. It is also known as a Massangea (see p. 992).—*V. zebrina*, Hort., is sometimes V. splendens, and sometimes Cryptanthus zonatus. For the latter, see discussion under Tillandsia and Fig. 2515.

L. H. B.

VULNERÀRIA. *V. Anthyllis*, Scop., is *Anthyllis Vulneraria*, which see in Vol. I. The other Vulnerarias are referred to the same genus.

VYÉNOMUS is another spelling for *Euonymus*.

2707. Vriesia carinata.

W

WAAHOO, WAHOO, or **BURNING BUSH** is *Euonymus atropurpureus. Ulmus alata,* the Winged Elm, is also called Whahoo or Wahoo.

WAFER ASH. *Ptelea trifoliata.*

WAHLENBÉRGIA grandiflòra. See *Platycodon.*

WÀITZIA (F. A. C. Waitz, born 1768, state physician to the Dutch at Samarang, Java; wrote on Javanese plants). *Compósitæ.* Includes one of the rarer "everlasting flowers," a half-hardy annual which grows about 1½ ft. high and bears flat-topped clusters, of yellow flower-heads, with a golden disk. The clusters are about 5 in. across, and the heads 2 in. across, the showy part being the involucral bracts, which are arranged in 4 or 5 series, and are petal-like in character but of stiffer texture than ordinary petals. Waitzia is a genus of 7 species of Australian herbs, mostly annuals: lvs. alternate, linear or nearly so: fl.-heads in terminal corymbs or rarely in oblong, leafy racemes: involucre various in outline, the bracts overlapping in many rows, all colored and petal-like: receptacle flat, without scales: anthers provided with tails of microscopic size: akenes somewhat compressed, glabrous or papillose, terminating in a slender beak; pappus of capillary bristles usually cohering at the base, simple, barbellate or plumose. The genus is distinguished from Helipterum and Helichrysum by the beaked akenes. Flora Australiensis, vol. 3.

grandiflòra, W. Thompson. (The authorship of this species is credited to Naudin by Index Kewensis.) Half-hardy everlasting or "immortelle," annual, exceeding 18 in. in height: lvs. lanceolate, long-acuminate, sessile, green above, slightly villous beneath, prominent midrib beneath: fls. yellow, in terminal corymbs. F. 1865:41, where it was originally described. Probably the most desirable of the genus. It seems to have replaced *W. aurea,* the favorite of the previous generation, being larger-fld., more robust, and rather easier of cultivation.
W. M.

WALDSTEÌNIA (Franz Adam, Count of Waldstein-Wartenburg, born 1759 at Vienna; wrote with Kitaibel an illustrated work on rare plants of Hungary; died 1823). *Rosàceæ.* The YELLOW or BARREN STRAWBERRY, *Walsteinia fragarioides,* is a little plant that looks much like a strawberry plant, but it has yellow flowers and bears no edible fruit. It is a hardy North American tufted perennial herb, about 4 in. high, with glossy lvs. composed of 3 wedge-shaped lfts. and 5-petaled fls. less than ½ in. across. It comes with the first rush of spring, and continues to bloom until summer. There is no satisfaction in growing only a few plants of this wild flower. The plant is appropriate to the rockery, where every effort should be made to induce it to form a dense mat. Masses of the Yellow Strawberry have been used with good effect for edging shrubbery borders, and the plant is listed by several nurserymen.

Only 4 species of Waldsteinia are well known. They are hardy, creeping, perennial, strawberry-like plants: lvs. alternate, mostly basal, long-stalked, entire, lobed, 3–5-cut or with 3–5 lfts., the lfts. crenate or incised: scapes bracted, bearing 2–5 yellow fls.: petals 5, obovate, about as long as the calyx-lobes; stamens indefinite: carpels 2–6: akenes obliquely obovoid, dry or slightly fleshy. Natives of north temperate zone.

fragarioides, Tratt. Fig. 2708. Popular description above. Pubescent or nearly glabrous: lfts. dentate or crenate except at the base, 1–2 in. long: scapes corymbosely 3–8-fld.: akenes 4–6. May, June. Woods and shaded hill-sides, New England to Minn. and Ind., along the Alleghanies to Ga. B.B. 2:218. R.H. 1890, p. 510. B.M. 1567 and L.B.C. 5:408 (both as *Dalibarda fragarioides*).
W. M.

WAKE ROBIN. In England *Arum maculatum.* In America, *Trillium.*

WALDMEISTER is *Asperula odorata.*

WALKING-LEAF FERN is *Camptosorus.*

WALL CRESS or **ROCK CRESS** is *Arabis.*

WALL FERN. *Polypodium vulgare.*

WALLFLOWER. Consult *Cheiranthus Cheiri.*

WALLÍCHIA (Nathaniel Wallich, 1786–1854, Danish botanist; wrote on plants of India). *Palmàceæ.* Three species of Himalayan palms, one of which, the first described below, is cult. outdoors in S. Fla. and S. Calif. and in Eu. under glass, and the second, while not advertised in America, is believed to be in a few northern greenhouses.

Low palms, cespitose, with short branching caudices, or in 1 species tall: lvs. densely fasciculate, terminal, distichous, scaly, unequally pinnatisect: segments solitary or the lowest in groups, cuneate at the base, oblong-obovate or oblanceolate, erose-dentate, the terminal one cuneate; midnerve distinct; nerves flabellate; margins recurved at the base; petiole slender, laterally compressed; sheath short, split, with the margins deeply crenate: spadices short-peduncled, the staminate drooping or recurved, ovoid, much branched, densely fld., the pistillate looser, erect; spathes very numerous, slender-coriaceous, the lower ones the narrower, tubular, the upper ones cymbiform, entire, imbricated: fls. medium, yellow: fr. ovoid-oblong, red or purple. Stove palms. For culture, see *Didymosperma.*

Wallichia is allied to Didymosperma, Arenga and Caryota, differing in having 6 stamens instead of an indefinite number. Caryota is the only one of this group with ruminate albumen. Didymosperma has a cup-shaped, 3-lobed calyx. and in Arenga the calyx has 3 distinct sepals.

2708. Yellow, or Barren Strawberry—Waldsteinia fragarioides (× ½).

disticha, T. Anders. Caudex 10–15 ft. high, 5–6 in. in diam.; naked: lvs. distichous, 6–10 ft. long, alternate, erect; lfts. 1–2 ft. long, 2–2½ in. wide, fascicled, linear, narrowed to the base, truncate and denticulate at the apex, with a large tooth on each side above the middle, glaucous beneath; petiole and sheath short, scurfy: lvs. disposed in a ⅗ spiral: fls. in many spiral series. Himalaya.

caryotoides, Roxb. (*Harina caryotoides*, Buch.-Ham. *Didymospérma caryotoides*, Hort.). Lfts. oblong or linear-oblong, panduriformly excised and acutely toothed, white beneath. F. 1874, p. 161. R.H. 1870, p. 368.

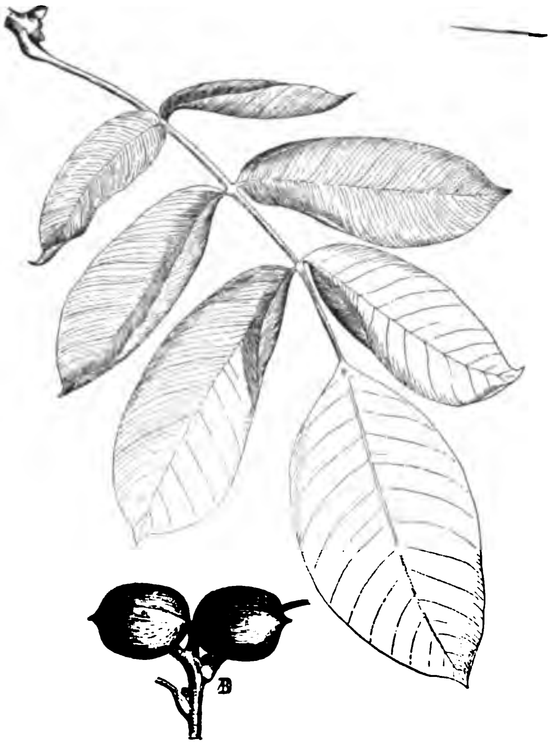
W. porphyrocárpa, Mart. See Didymosperma.

Jared G. Smith.

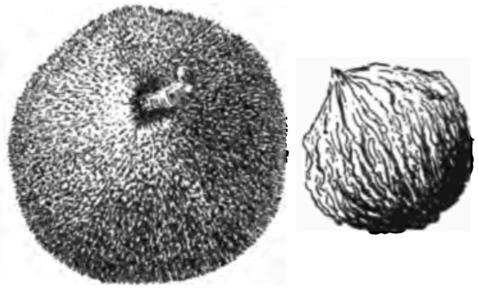
WALL PEPPER. *Sedum acre.*

WALNUT is a name applied to any species of the genus Juglans. The Walnut of history is *Juglans regia* (Fig. 2709), a native of southeastern Europe and regions beyond. Etymologically, the word Walnut signifies a nut that comes from a foreign source. It is interesting to note that in this country *Juglans regia* is known as English Walnut, apparently because the imported nuts are likely to reach us by way of England. In eastern North America, the word Walnut usually applies to the native *Juglans nigra* (Figs. 2710, 1193), although it sometimes, but erroneously, designates the large-fruited hickories. A related species, the butternut (*J. cinerea*, Figs. 2711, 1194) is sometimes called White Walnut. The Black Walnut (*J. nigra*) is often planted on roadsides and about yards, but it is scarcely a horticultural product yet. A very similar species in California is *Juglans Californica* (Fig. 2712), which makes a fine large tree and often bears excellent nuts. The eastern *J. nigra* was early introduced into California and it seems now to be common. In fact, it is sometimes difficult to distinguish the two species. The Californian species attains a height of 50 ft., making a broad-topped handsome tree. Commercial Walnut culture is concerned with *J. regia*, and this culture is practically confined to California. The species is hardy even as far north as parts of New York, and in the Middle and Southern states it often bears well, but its culture is not attempted on a large scale in the East. The Japanese Walnut, *J. Sieboldiana* (Figs. 1196–8) is now becoming known in the East, and it is perfectly hardy in central New York. It is a handsome tree, but it probably will not become an important fruit tree. For the species of Walnuts, see *Juglans*.

L. H. B.



2709. Juglans regia, the Walnut of commerce (× ¼). Often known as the "English" Walnut.



2710. Black Walnut—Juglans nigra (× ⅓). On the right is the bare nut; on the left the husk not removed.

Walnuts in Southern California. Fig. 2713. The Walnut industry in certain limited areas of California occupies a place second only to the growing of citrous fruits. About 6,000 tons will be exported from California the present season (1901), which will be worth f. o. b. California more than one million dollars.

Commercial Walnut culture is confined to four southern coast counties of California—Santa Barbara, Ventura, Los Angeles and Orange. For this there are good and sufficient reasons. Although called the "English" Walnut in this country, the climate of England is not very well suited to its production, and the greater part of the product in that country is used in the manufacture of pickled Walnuts. The Walnut is fairly hardy when dormant, but very tender when growing. Therefore, no place subject to late spring frosts can grow Walnuts with success. The extension of Walnut culture into the more northern coast counties of California must be done by planting varieties which lie dormant until the time of the spring frosts is past. The immature nut is also very tender, and cannot endure very hot weather. Even in the coast counties a small percentage of the crop is often destroyed by hot weather, and the hot interior valleys of southern California, or places very distant from the ocean, do not produce Walnuts. The area of successful production is still further limited by the requirement of well-drained and deep alluvial soil for the tender rootlets. Any soil of a clayey nature or underlaid with a hard clay subsoil will produce only stunted trees, while on soil where the water comes nearer than twenty feet of the surface the trees will grow only a few years, hardly long enough to produce a full and profitable crop.

In nursery practice the nuts are scattered at a distance of about 1 ft. in drills 4 ft. apart, late in the fall, in soil that has been deeply plowed. As soon as a sufficient number of the plants break through to distinguish the rows, the cultivator is run through to kill the weeds. The young seedlings are irrigated and cultivated frequently during midsummer, the object being to force them as much as possible and yet harden them before winter. During the first year the seedlings reach a height of ½–2 ft. The taproot, however, grows down from 5–8 ft. If grown in the nursery the second year, they are treated in the same manner, and usually reach a height of 8–12 ft. Of late years the practice of grafting has been growing in favor. The 1-year-old seedlings are root-grafted, just as they stand in the row. The grafts will grow about 8 feet in one year. Grafting is much more successful than budding. When trees are budded, ring-buds are used, and the tie is a strip of waxed cloth.

The trees are planted in orchard form at either 1 or 2 years of age, preferably the latter. They are usually set in squares 50 ft. apart. The trees make very little growth the first year, many of them not more than 6 inches. After this the growth is rapid. The trees are tied to stakes with strips of cloth, since they are very tender when growing, and the swaying of the tree by the wind quickly causes any other tie to cut through the bark. Walnut trees are pruned very little. At first small limbs are allowed to start about the trunk, but later these are pruned off to a height of 4 feet. Some of the longer growths are shortened back while the trees are young; and after they are older the low limbs which bend down in the way of cultivating are removed.

The Santa Barbara Softshell begins to bear the third year from planting, but does not produce profitable crops before the fifth or sixth year. Precocity in bearing is not a desirable quality in Walnuts, since no Walnut tree will produce a profitable crop until it attains sufficient size to support it. Hardshell trees do not bear as young, and they are not regular bearers.

Walnut orchards in California receive thorough tillage. They are heavily irrigated in winter, and plowed about 8 in. deep in the spring. After this they are irrigated and cultivated until the nuts begin to fall,—about the 1st of September. Late irrigation fills out the nuts and causes the hull to open readily. Heavy fogs are also desirable during harvesting. The nuts are shaken down and picked up. They are then spread in trays about 5 in. deep until dry, when they are bleached and shipped to market. Walnuts were formerly bleached with fumes of sulfur, but this was found injurious to the nut. They are now usually dipped in a solution of chloride of lime (chlorinated lime) and sal-soda, to which a sufficient amount of sulfuric acid has been added to set free the chlorine.

The majority of Walnut-growers are organized into local associations. Representatives of these associations form the executive committee of the Southern California Walnut-Growers' Association. This executive committee provides the form of contract which the local associations may enter into with brokers, and fixes the price. The local associations are managed in several ways. In some the growers bleach their own crop, while in others the association performs this work at its own packing house.

2711. Juglans cinerea of the eastern states. (X ⅜.)

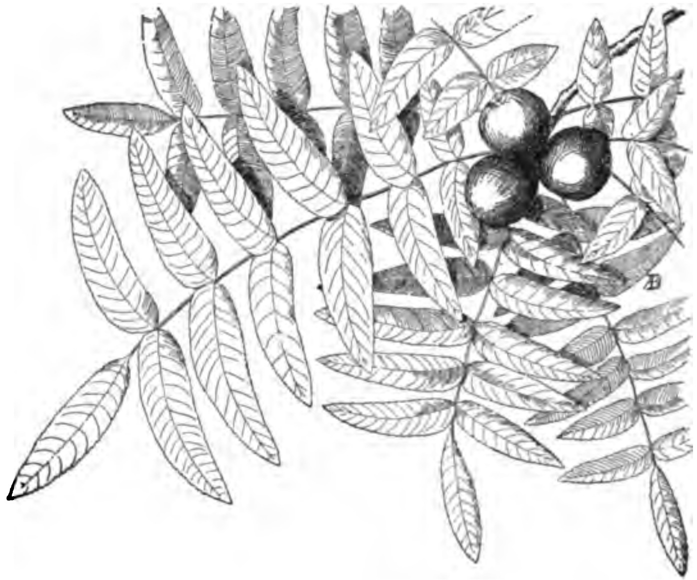
Sometimes known as White Walnut.

The Walnut tree has very few pests. The red spider sometimes attacks the trees, but it is not considered a serious pest. Of late years a bacterial growth has developed to a considerable extent which is more serious. This attacks and destroys the immature nut and the small limbs of the tree.

Arthur Staley.

The Walnut in Central California. Walnut-growing is quite rapidly extending in both the coast and interior valley regions of Central California and is also successfully accomplished in favorable situations in the foothills up to an elevation of 2,000 ft. There are also many instances of thrifty and prolific trees in northern California and southern Oregon. This northward extension of successful Walnut growing is conditioned upon the use of the best French varieties and the rejection of the varieties popular to the chief commercial districts in southern California, viz., Præparturiens, Mayette, Chaberte, Parisienne, Franquette, etc. These varieties are hardier in resistance of frost and leaf-burn from summer heat. They are largely root-grafted upon the seedlings of the California Black Walnut in the nursery and are also being top-grafted upon old native trees.

E. J. Wickson.



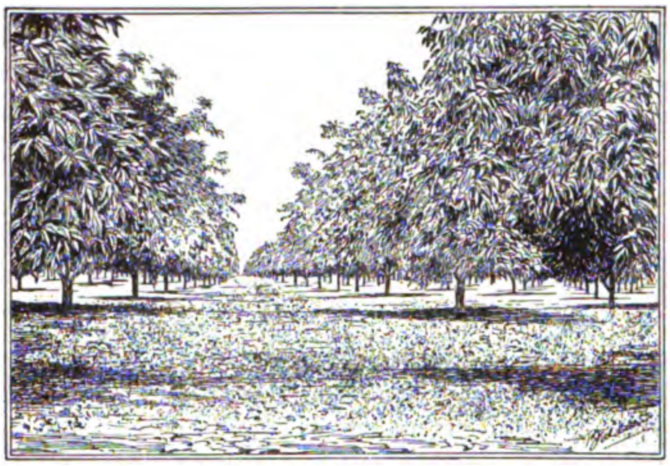
2712. The California Wild Walnut—Juglans Californica (X ¼).

Walnut Bacteriosis.—Chief among the more serious diseases of *Juglans regia* in the United States is a bacterial blight of the nut, branch and leaf of that tree. This blight now has its greatest development along the Pacific coast, especially in Orange and Los Angeles counties, California. The germ which causes this disease is a newly described species of Pseudomonas (*P. juglandis*). Different effects of the disease are shown in Fig. 2714.

The organism of Walnut bacteriosis winters in the fallen nuts, in the diseased tissues of affected branches, and especially in the pith cavity of the latter. New infections occur as soon as spring growth begins, taking place near the growing point of branches, in the opening leaves, and upon the young and tender nuts. The finer lateral veins of the leaves and the adjoining parenchyma are destroyed, and the midrib is often affected. The injury resulting from infection of the branch will largely depend on the tenderness of the latter at the time and point of infection. If the tissue is tender a canker-like spot will be eaten through to the pith, or the entire end of the shoot may be destroyed. If the nut is infected while small, its complete destruction usually follows, the digestive action of the germ involving hull, shell and kernel. Nuts infected early in the season mostly fall when small, while later infections frequently result only in the destruction of the hull and the blackening of the outer layers of the shell, the tissues having become too hard for the further progress of the disease. As in the case of pear blight, rapidly growing trees are more subject to injury than those making a slower and hardier growth. The spread of the microorganism through infected branches is generally only local—it rarely extends more than a few inches from the point of infection. A marked blackening of the injured parts results from the rapid oxidation of the tannic acid they contain, though this is not distinctive of injury from this disease. *Pseudomonas juglandis* is actively motile; hence fogs, rain or dew aid in its spread and increase the number of infections. The water of irrigation may carry the germ for miles.

The destruction of the tissues of the Walnut is effected by means of two ferments or enzyms secreted by the organism. One is a diastatic ferment which converts the starch of Walnuts into grape sugar; the other is a peptonizing ferment which digests the proteids of the cells. The action of these ferments becomes manifest in the development of a water-soaked band immediately surrounding the margin of the blackened infected spot if the disease is active, and this appearance readily distinguishes this malady from all other injuries to the nut or branch. As the secretion of the two ferments depends largely upon a temperature of 65° to 75° F., a much lower temperature is unfavorable to the destructive action of the blight upon the tissues, and when such low temperature prevails the infected points are likely to be cut out through the action of the cells of the Walnut.

The losses from Walnut bacteriosis are often heavy, especially in individual orchards or special localities. A loss of 50 per cent of the crop is not uncommon, and occasionally as high as 80 per cent of the nuts are affected in badly diseased orchards.



2713. Walnut orchard in Southern California.

The treatment of this Walnut disease has been found to be difficult, but the spraying of the dormant tree has shown a considerable saving when Bordeaux mixture is used. It has also been learned that the hardshell Walnuts are comparatively free from this disease, and that certain softshell varieties are so nearly free that the grafting of nursery stock from these resistant trees is contemplated for new orchards. As no species of Walnut except *J. regia* has thus far shown this disease under natural conditions, many hybridizations have been undertaken in hope of obtaining resistant and satisfactory trees by this means Newton B. Pierce.

WALNUT, INDIAN. *Aleurites triloba.*

WAND PLANT. *Galax aphylla.*

WANDERING JEW. *Zebrina pendula* and *Tradescantia fluminensis.* Also *Saxifraga sarmentosa.*

WARATAH. *Telopea speciosissima.*

WARDER, JOHN ASTON, physician, author, horticulturist and forester, was born at Philadelphia, January 19, 1812. His early life was spent in a suburban home, where he evinced a love of nature which he cherished through life. Bartram and Darlington were among his neighbors and he met in his father's house men like Audubon, Michaux and Nuttall. In 1830 his parents moved to Springfield, Ohio, where he helped clear up a farm and first became interested in agricultural sciences and comparative anatomy. He was graduated at Jefferson Medical College, Philadelphia, in 1836. He settled in Cincinnati in 1837 and began the active practice of medicine. He was early elected a member of the school board and did faithful service for many years, making it his business to travel through the eastern states and cities to study systems of teaching in order to introduce improved plans into the Cincinnati schools. He was actively interested in and a prominent member of the Cincinnati Astronomical Society, The Western Academy of Natural Sciences, the Cincinnati Society of Natural History. He was one of the founders of the Cincinnati Horticultural Society and the Wine-Growers' Association. He was also prominent in the old Cincinnati College and afterward in both the Ohio and Miami Medical Colleges. He was for many years president of the Ohio Horticultural Society and vice-president of the American Pomological Society. He was among the first to draw public attention to the improvement of public grounds, private parks and cemeteries. The present interest in landscape gardening in this country is largely due to his efforts and writings. He was interested in establishing the famous Spring Grove Cemetery, one of the earliest and best of landscape or lawn cemeteries, and was one of the first residents of Clifton, whence he moved to a farm near North Bend, Ohio, formerly owned by President Harrison. There he spent most of his time in testing varieties of fruit and methods of culture, and prepared numerous practical papers for horticultural societies and other readers, and in fact established a private experiment station.

In 1850 he began the publication of the Western Horticultural Review, which continued four years. In one number is contained the first description of the *Catalpa speciosa*, now recognized as one of the valuable forest trees. His report of the Flax and Hemp commission, published by the government in 1865, was the result of much patient study and investigation. "Hedges and Evergreens" appeared in 1858. "American Pomology — Apples," published in 1867, was the result of more than 16 years of careful study, aided by hundreds of correspondents in various parts of the central states. It is still considered a standard authority on description and varieties of apples, containing a table of varieties and synonyms of over 1,500 names.

A report upon Forests and Forestry was the result of his visit to the World's Fair at Vienna in 1873, as United States Commissioner. In 1875 he issued a call for a convention at Chicago to form an American Forestry Society, which organization was completed at Philadelphia in September, 1876. The public was not yet impressed with the importance of the subject, but this pioneer association gave impetus to the plans for united effort. In 1879–80, with the approval of various societies, Dr. Warder memorialized Congress, asking for a commission for the study of forestry in Europe, but general interest was not thoroughly aroused until, largely through his efforts, the American Forestry Congress held its meeting in Cincinnati in April, 1882. He was honorary president of the Ohio State Forestry Society, prepared strong memorials to Congress on behalf of the forests and was shortly afterward appointed agent of the Department of Agriculture to report upon forestry of the northwestern states. He was devoted in his interest in all which concerns rural life and industry; his efforts had a great and marked effect on the horticulture and outdoor art of the great central states. Death ended an active and useful life July 14, 1883.

R. H. Warder.

WARDIAN CASES are nearly air-tight glass cases used for transporting growing plants on long sea voyages. For this purpose they furnish the best and safest method. They furnish the necessary light, protect the plants from salt spray and foul gases, and require a minimum of care, as the plants need no watering. They maintain nearly uniform conditions of temperature, moisture and atmosphere. Similar cases are also used in greenhouses for growing filmy ferns, dwarf foliage plants and other small specimens that require a very moist and close atmosphere. They were invented about 1836 by N. B. Ward, who wrote a book of 95 pages "On the Growth of Plants in Closely Glazed Cases," published at London in 1842.

WARCZEWICZÉLLA. See *Zygopetalum*.

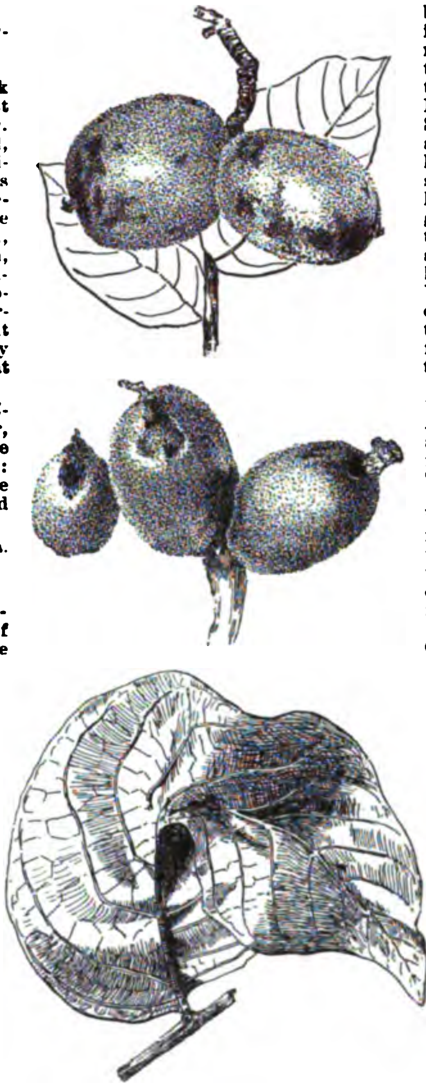
WÁRREA (named for Frederick Warre, who discovered the first species in Brazil). *Orchidàceæ.* Lvs. few, long, plicate: scape tall, bracted, bearing a raceme of terminal showy fls.: sepals and petals subequal, concave, the lateral sepals united with the base of the column: labellum not spurred, united with the base of the column, undivided, concave, with longitudinal ridges: column without appendages: pollinia 4, with a narrow stipe. Plants with the habit of small forms of Phaius. They require the same treatment as that genus.

bidentàta, Lindl. (*W. Lindeniàna*, Henf.). Labellum regular, slit at the end: ridges convex, the central ones thinner and deeper: bracts one-fourth as long as the pedicels. Sept. Venezuela and Colombia. A. F. 6:655.

W. cyànea, Lindl.—Aganisia cyanea.

HEINRICH HASSELBRING.

WASHINGTON, HORTICULTURE IN. Fig. 2715. The state of Washington may be said to have two distinct climates, that to the west of the Cascades, and that to the east of this range of mountains. The climate of western Washington may, generally speaking, be said to be very temperate. There are no very great variations in temperature. The summers are cool, and in some parts somewhat dry. The winters are warm, or at least not cold. In some parts of western Washington the rainfall is abundant, amounting to 70 or 80 inches; in other parts the annual rainfall does not exceed 25 inches. Those portions of western Washington not bounded on the west by the Olympic mountains are subject to a much greater rainfall than those parts lying immediately east of these mountains. Thus, parts of Jefferson county and of Island county are comparatively dry, even though on what is known as the wet side of the mountains. The whole of western Washington is a vast forest; yet there are numerous valleys in which trees do not grow. The natural forest growth is coniferous, except along the watercourses, where there is a considerable growth of deciduous trees, such as alder, poplar, willow, etc. In a few places scattering specimens of oak, ash and maple are found. Vast areas of land have been reclaimed from the sea, or at least from Puget Sound, and these tide-lands are amongst the best in the state. The summers are comparatively bright and dry, the winters wet and almost sunless.



2714. Bacteriosis of the Walnut, as shown on fruit and leaves. See page 1961.

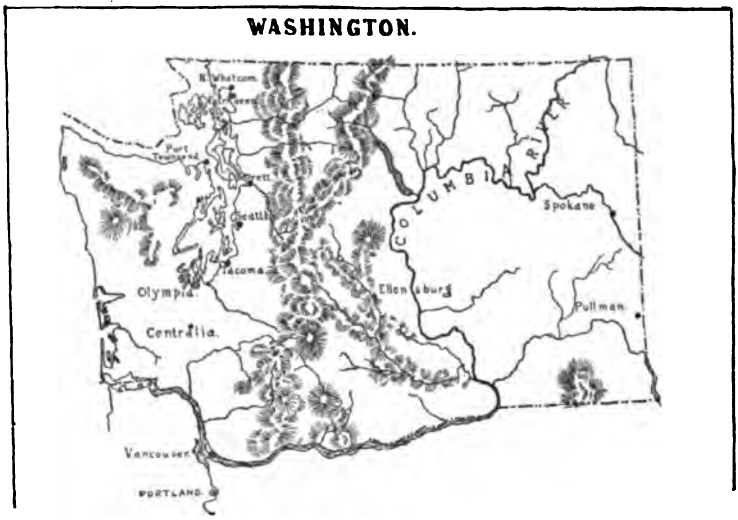
In eastern Washington a wholly different condition exists. The summers are bright, the temperature high, and during the months of June, July and August practically rainless. Eastern Washington has a varying rainfall. Those portions immediately east of the Cascade range have a very scanty rainfall, but as we near the eastern borders of the state the rainfall becomes greater. In and near the Yakima valley, the rainfall is from 4–6 in. per annum. As we go east the rainfall becomes greater, until at the eastern borders of the state it is about 22 inches, quite sufficient in this climate to produce good crops. Altitude has a marked influence on the climate of eastern Washington. In the valleys of the Columbia and Snake rivers, from 400 to 600 feet above sea-level, the summers are long and hot, and in these portions severe frosts are not felt. In these low valleys the tenderer fruits grow to perfection, but of these there are only a few thousand acres. There are two large valleys; viz., the Walla Walla and the Yakima, each having an altitude of about 1,000 feet, where the winters are more severe, and where fruit trees often suffer in bud and twig, and where vegetation is at a standstill for a longer period in winter than in the lower altitudes. All lands in eastern Washington at a lower altitude than 1,500 feet must be irrigated to produce crops. The larger portion of eastern Washington, and especially that bordering on Idaho, is high, ranging from 1,800 to 2,600 feet above the sea. It is in these high portions that there is rainfall sufficient to raise good crops without irrigation.

The whole state is rolling. The Cascade range cuts the state into two very unequal parts, the larger part lying to the east. The watercourses, for the most part, run in deep cañons, and the table-lands are anything but level. The soil varies from the deep basalt clay loams to the volcanic ash, and to the sand and silica soils of the river bottoms. The higher lands grow the hardy fruits to perfection; the river bottoms grow the peach, apricot and the grape, while midway between these is grown a great variety of fruits, garden products and alfalfa. The best wheat lands are the heavy clay soils at an altitude of about 2,000 feet.

Fruits.—The state of Washington is fast coming to the front in fruit production. There are now planted within its borders about 80,000 acres of fruit. Whitman county, on the eastern border, has an acreage of 8,000 planted to fruits, mostly apples and prunes. Clark county, on the west of the range, is the greatest prune producer. The Puyallup valley, close to the Puget Sound, is the leading small-fruit section, but the whole state is adapted to many of the fruits. The counties producing the largest amount of fruit are Walla Walla, Yakima, Whitman, Clark, Spokane and Kittitass. The islands of Whidbey and Orcas are famous for their fruits. Of the 80,000 acres in fruit now growing within the state, 25,000 acres are in prunes, mostly Italian, 40,000 in apples, and the remainder in plums, cherries and grapes.

Prunes.—The Italian prune (Fellenberg plum) is planted in great numbers on both sides of the state. Clark county has not less than 5,000 acres planted to this fruit, and is still planting more. There is no other portion of the United States, and perhaps not in the world, where this variety is so largely planted. There is a demand for a large, somewhat acid prune, and the Italian is satisfactory. The demand is growing and new markets are constantly being opened up.

The French prune (Agen, Prune d'Agen, Petite, etc.), is planted in considerable numbers, but nothing like the Italian. Washington seems to be unable to compete with California in the production of this fruit. Nevertheless it is fairly profitable in Washington, yielding about the same number of pounds to the tree as the Italian, and selling in the eastern markets at a good price. But the Italian usually sells for more money, as the fruit is much larger.



2715. Washington, to illustrate the general physical features.

The Silver prune, or Coe Plum (Coe Golden Drop), is a large, handsome prune when well prepared and always brings the top market price, selling for two or three cents per pound more than Italian or French. Not a great many are planted, and in some cases the prune-growers work their silver prunes over to Italians. There are numerous varieties of prune planted on the coast, but none in so great quantities as the Italian. Much of the fruit of this prune is shipped green, i. e., in a half-ripe condition. This finds its way to the most eastern markets, and some of it even to England. The fruit of the Italian stands shipment well, better than any other variety. Most large growers have evaporators in their orchards, and the most of the fruit is preserved in this way.

Apples.—The late-keeping winter apple undoubtedly leads all other fruits in the total acreage now planted in the state. The counties shipping the greatest quantity are Whitman, Walla Walla, Yakima and Spokane. The varieties mostly planted are Ben Davis, Gano, Northern Spy, Wagener, Esopus, Arkansas, Jonathan, Yellow Newtown and Baldwin. The lower warm valleys grow the long season apples, like Yellow Newtown and Esopus, to perfection, while the higher altitudes are best adapted to a shorter season fruit, like the Wealthy and the Gravenstein. All apples color finely, and are very fair in appearance. There are few off years, but there seem to be full years and slim years, though the crops are much more constant than in the middle or eastern states. Apple growing is amongst the most profitable of the fruit industries. Many large orchards have been planted that are not yet in bearing. At present the state grows much more fruit than it can consume.

Pears.—Pears are grown to great perfection in almost every part of the state, but there is no finer fruit than that which comes from the low warm valleys of the Snake, the Columbia, Walla Walla and Yakima. The Bartlett is the great summer pear, followed closely by Flemish Beauty. For fall and winter, Anjou, Clairgeau, Easter and Winter Nelis are largely grown. Pears have been successfully shipped from the Pacific coast to Liverpool and London. The planting of pears is not receiving the same attention as the planting of apples, yet a number of acres are annually added to the orchards of the state.

Plums.—Certainly nowhere on this continent is the plum more at home than on the Pacific coast. Unfortunately plums are not profitable. At present there are no canneries to take care of the surplus fruit, and most of the plums are poor long-distance shippers. There is a local demand for a considerable quantity of plums, but great quantities annually go to waste under the trees. The varieties mostly planted are Washington, Jefferson, Peach, Pond, Lombard and the Damsons.

Cherries.—Sweet cherries grow to great perfection in all portions of the state, but especially so in the Puget Sound region and in the warm valleys of the east side. Some new varieties, natives of the coast, notably Bing, Lambert and Lewelling, give great promise, and already are leaders in the markets of the West. The sour varieties also grow and yield abundantly. Sweet cherries attain their greatest perfection in the warm valleys at an altitude not much above 1,000 feet. Sour varieties do best on the high lands, at an altitude of about 2,000 feet. Cherries have been found to be profitable, yet few new plantations are being set. The reason for this is probably to be found in the labor market, it being almost impossible to get the necessary help to care for a large crop of cherries.

Grapes are not planted to the same extent here as in the eastern and middle states. The native varieties do not seem to succeed so far north, except in a few favored spots. In the low warm valleys of the Snake and Columbia all varieties seem to do well. Even the European (*Vitis vinifera*) here grows to perfection, and usually receives no special winter protection. These Old World grapes are fairly profitable, the local market usually being good.

Small Fruits.—The raspberry, blackberry, dewberry, strawberry and gooseberry all do well in the state. In some sections of western Washington these fruits are grown in great quantities and are mostly shipped to the Montana markets. While the prices realized are not large, the crops are so abundant that small-fruit farming pays well.

Cranberries grow in the coast counties and on some parts of Puget Sound. Where suitable land is found the returns from cranberry culture are said to be very satisfactory.

Cauliflower and Cabbage Seed.—The production of these seeds is now carried on in an extensive way on Laconner Flats (reclaimed tide-lands) on Puget Sound. The demand is good, and the crop profitable. Cabbage and onion seed is produced in great quantities.

Bulbs.—At Whatcom, Whatcom county, an attempt is now being made to cultivate what are known as Holland bulbs. There are two establishments engaged in growing hyacinths, tulips, narcissus, etc., and the results are promising. Tulips make great numbers of offsets, and hyacinths propagate freely by the same methods practiced in Holland.

Horticulture, as an occupation, may be said to be profitable within the state. It is true, markets are at a great distance, but the mines in Idaho, Montana and

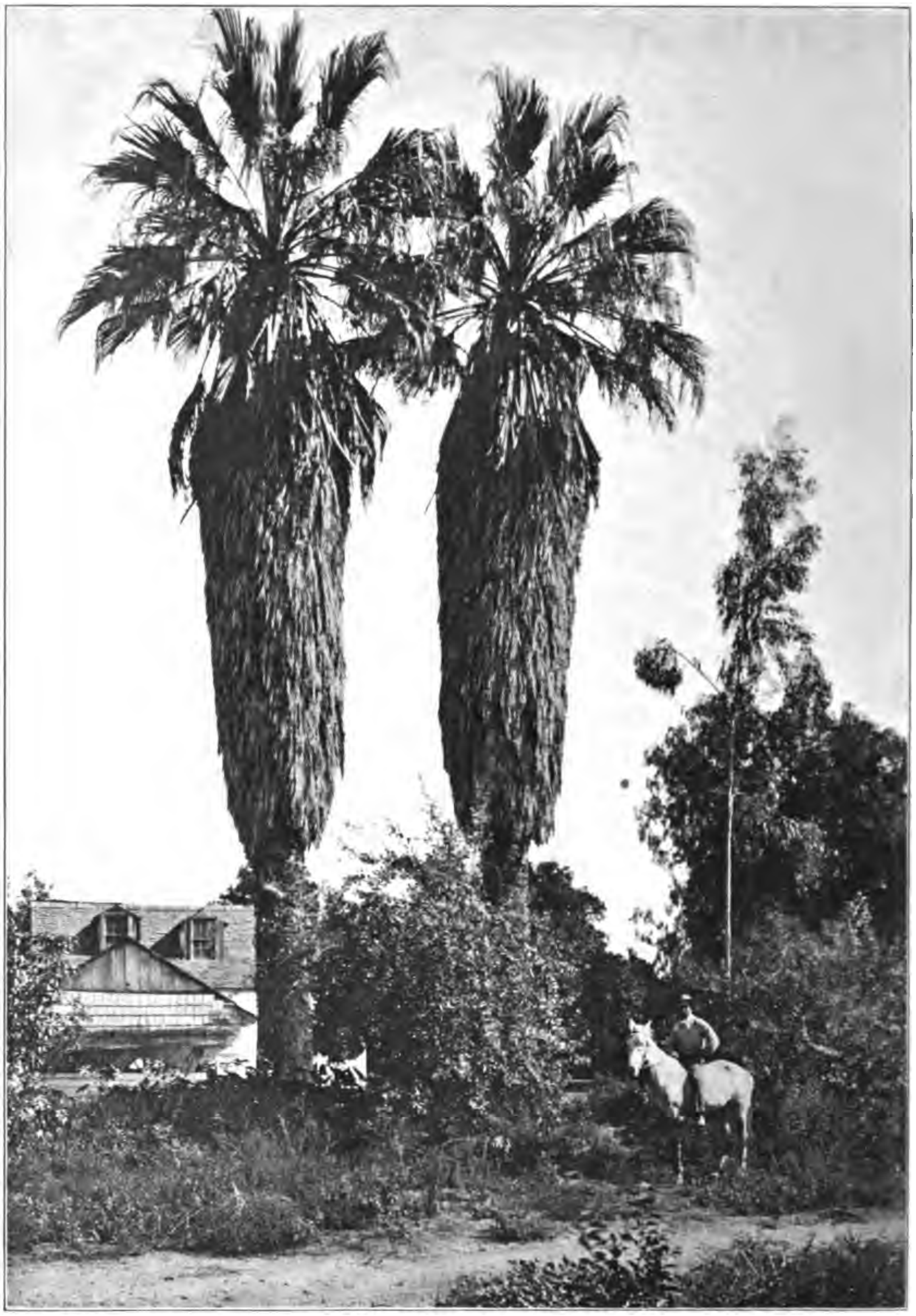


Plate XLVIII. Washingtonia filifera, the most characteristic palm in California.

British Columbia take great quantities of fruit and vegetables. Shipments of perishable fruits have not always been found to be profitable, but the state is fast settling up, and the outlook for the horticulturist is very bright.

J. A. Balmer.

WASHINGTON GRASS. See *Cabomba*.

WASHINGTÒNIA (named for George Washington). *Palmàceæ.* Tall palms, with the robust trunks clothed above with remains of the sheaths and petioles: lvs. terminal, ample, spreading, orbicular, flabellately plicate, lobed nearly to the middle: segments induplicate, filamentous on the margins: rachis short: ligule large, appressed: petiole long, stout, plano-convex, very spiny along the edges; spadices long, copiously paniculately branched, glabrous: branches slender, flexuous; spathes long, membranous, split, glabrous: fls. white: fr. small, ellipsoid, black. Species 3. Ariz., S. Calif. and Mexico. Plate XLVIII.

filifera, Wendl. (*Bràhea filamentòsa*, Hort. *B. filifera*, Hort. *Pritchárdia filamentòsa*, Wendl. *P. filifera*, Hort.). Weeping Palm. Figs. 2716, 2717. Stem cylindrical, 20–40 ft., enlarged at the base (2–3 ft.), covered with persistent petiole bases; petioles 2–5 ft. long, 1–2¼ in. wide at the summit, glabrous, plano-convex, the rather thin margins with stout, hooked spines; ligule large, glabrous, lacerate; blade circular, tomentose on the margins of the 40–60 segments, 3–5 ft. in diam., cleft on the upper side nearly to the middle, gray-green; segments margined with numerous fibers 6–12 in. long. S. Calif., W. Ariz. Gn. 25, p. 393. G.C. III. 12:591. R.H. 1876, p. 372; 1895, pp. 153–155. G.F. 6:535. Gt. 1896:5.—*W. filifera* is perhaps the most characteristic palm of California. Its immense straight bole and shaggy collar of deflexed dead leaves make a striking and picturesque object. This collar of old leaves usually burns fiercely in the dry season.

robústa, H. Wendl. (*Washingtònia Sonòræ*, Hort. in part). Stem more robust: petiole shorter and more densely spiny, the young plants with yellow spines and black-violet sheaths and petioles, at length brown; blade light green, 3 ft. long by 3¾ ft. wide; segments 60. Western Mex. G.F. 38:49. R.H. 1885, p. 403.

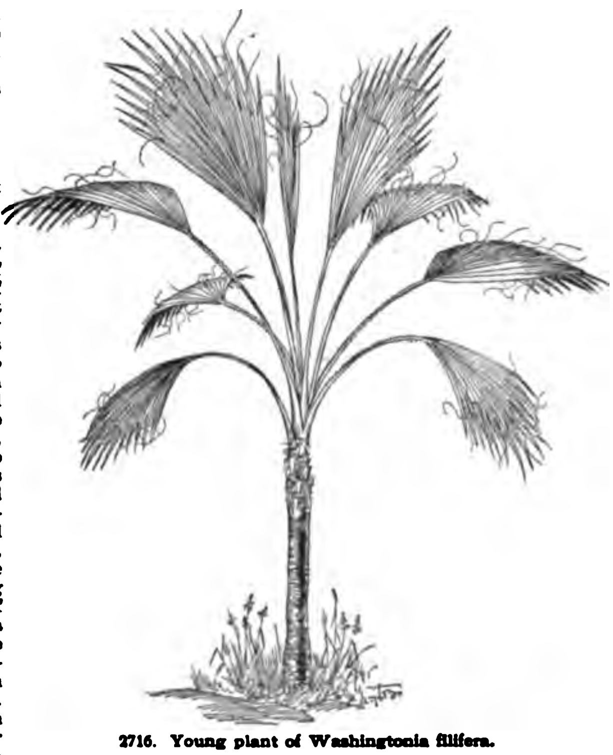
Sonòræ, Wats. Stem 25 ft. high, 1 ft. in diam.: lvs. 3–4 ft. in diam., somewhat glaucous, very filiferous; petioles 3 ft. long, very slender, 2 in. wide at base, ¾in. at apex, floccose-hairy along the margins and with stout curved spines: fr. ¼ in. long, edible. Mex.

Jared G. Smith.

Further Notes on Washingtonia.—Our nursery catalogues show that the identity of the three species of Washingtonia is a matter of conjecture in the minds of growers. In middle California there are two distinct types in general cultivation: (1) the one having very filamentous deeply cleft leaves, long (3–5 ft.) petioles with yellow margins and spines, which is the Colorado Desert species, *W. filifera*, Wendl.; it is less hardy in San Francisco than *W. robusta*, suffering from cold winds and fogs and often rotting at the center of the growing part. (2) The species with more robust habit, the growing part of the stem shorter and therefore more distinctly conical, dark leaf-sheaths, short, stout petioles with brown, often very dark margins and spines, and shorter, more rigid, less deeply cut and often less filamentous leaf-blades, which is the one from Mexico and Lower California, *W. robusta*, Wendl. (*W. Sonoræ*, Hort. Calif. in part). This dark color of the petiole margins and spines is equally noticeable in the young as well as in older specimens. Comparative study of the inflorescence may perhaps establish this palm as a mere geographical variety of *W. filifera*, but we have not been able to study flowering specimens. It is certain that a part of the material offered by nurserymen under the name of *Washingtonia Sonoræ* is really *W. robusta*. Its greater hardiness in the climate of San Francisco shows that *Washingtonia robusta* is by far the most desirable species for cultivation along the coast of middle California.

The following data give evidence that many of the specimens in cultivation in the San Francisco bay region have originated from Mexican seed and are not, as is sometimes suggested, mere cultural varieties developed from seed of the typical form of the Colorado Desert. According to Charles Abraham, for many years proprietor of the Western Nursery, San Francisco, seed of *Washingtonia robusta* was introduced some twenty-five years ago by Mr. Sressovitch, a commission merchant of San Francisco, from the coast of Mexico near Guaymas. Of the trees raised from this seed there is a specimen at Abraham's nursery, and Mr. Abraham states that there is a fine one in the grounds of St. Ignatius College, San Francisco, and another at the Crocker residence in Sacramento. The latter has already matured seed, from which Mr. Abraham has raised a young plant. In the old Bolton garden at Greenwich and Jones streets, San Francisco, there were growing until this year several well-marked specimens. According to Miss Lizzie Bolton, these were raised from seeds presented to her mother, Mrs. James R. Bolton (formerly Mrs. Estrada) by friends who brought them from Mazatlan. These specimens are now in Mr. Abraham's possession. A third importation of seed was made by Mr. John Rock, manager of the California Nursery Co. at Niles, but we do not know whence it came.

Washingtonia Sonoræ is rarely seen in cultivation, though frequently mentioned in nurserymen's catalogues, and it is certain that much of the material offered under this name is really *W. robusta*. In his "Flora of the Cape Region of Baja California," in Proc. Calif. Acad. Sci., series 2, vol. 3, pp. 109–182, Mr. T. S. Brandegee records that *Washingtonia Sonoræ* occurs at La Paz and San José, and notes that "a species of Washingtonia is abundant in the cañons of the mountains and may be this one." A few years ago Dr. Gustav Eisen is reported to have collected seeds of a Washingtonia at La Paz, which were handed to a gardener in San Francisco for propagation; some of the seedlings were obtained by Mr. Abraham, but only one survived; this specimen shows the characteristic slender petiole and glaucous leaf of the true *W. Sonoræ*. This species appears to be much less hardy under cultivation than *W. robusta*.



2716. Young plant of Washingtonia filifera.

From the above notes it would appear that both *W.*

Sonoræ and *W. robusta* are found along the Pacific slope of Mexico, on the mainland or on the peninsula of Baja California. While the type locality of the former is given as Guaymas, on the mainland of Mexico, the few specimens in cultivation have come from the peninsula, and though the type locality of the latter is unknown, most of the specimens in the trade apparently came from Guaymas and Mazatlan on the mainland.

2717. Old tree of Washingtonia filifera.

In cultivation in California Washingtonias respond gratefully to abundance of water during the dry season. It is a mistake to suppose that because they are desert plants they will thrive without moisture; in Palm valley, in the San Jacinto mountains, where they grow luxuriantly, they are said to be found only in the vicinity of springs.

Jos. Burtt Davy.

WATER ALOE. *Stratiotes aloides.* **W. Arum** is a name sometimes applied to *Calla palustris.* **W. Beech.** *Carpinus Caroliniana.* **W. Caltrops,** or **Water Chestnut.** *Trapa natans.* **W. Chinkapin,** or **Chinquapin.** *Nelumbo lutea.* **W. Cress.** See *Cress* and *Nasturtium officinale.* **W. Hyacinth.** See *Eichhornia.*

WATERING. An abundant and convenient supply of pure, fresh water should always be a first consideration in locating a garden or greenhouse. Having this, the next matter is knowing how to use it, for here, good gardeners say, lies nine-tenths of the elements of success. Certain it is, especially in the indoor cultivation of plants, that more depends upon knowing when to give or withhold water than upon any other single matter. The art of watering is unteachable; it requires experience, judgment, skill. Some knowledge of the commoner facts of vegetable physiology, physics and soil physics will be helpful, but even then experience will be necessary. Two common types of watering-cans are shown in Fig. 2718. In American gardens, however, watering is usually performed with a hose from a stored water supply.

General Rules.—A fairly safe guide is: never water plants until the soil has become dry, though not "powder-dry," and then give them a thorough soaking. Plants dislike a continuously wet soil. In the care of plants in earthenware vessels, a useful test is to thump the jar. If it rings the soil is dry; if the sound produced is dull the soil is sufficiently moist. Such rules, however, are only for the novice. They presuppose activity of growth, and take into account only one consideration aside from this, and that is the condition of the soil as regards moisture. The experienced gardener reads his practice in his plants and the conditions under which they are being kept. The following suggestions are based upon the most important considerations.

Actively growing plants may be watered very freely, as a rule, whereas in a dormant or semidormant state the same plants will require only occasional waterings.

Soft-stemmed or rapid-growing plants ("soft-wood" and "hard-wood" plants), and those with large leaves, need, as a rule, an abundance of water when growing actively. Hard-wood or slower-growing plants, with smaller leaves, must be watered with greater care. Soft-wooded plants, with some exceptions, may at times even flag somewhat for want of water, and recover without permanent injury when a fresh supply is given. Hard-wooded plants, as camellias, azaleas and heaths, on the other hand, suffer permanent injury from becoming too dry. It is safest to allow no plant in active growth to flag.

The amount of foliage affects the plant's capacity for using water. Plants which have been cut back, or which from disease, insects or other causes, have lost most of their foliage, must be kept drier until they have regained their foliage.

Unhealthy plants are benefited, as a rule, by being kept rather dry until they begin to show signs of renewed vigor.

Small cuttings, or any plants freshly potted or newly transplanted, are not in condition to use much water until the root-hairs have attached themselves to the soil-particles and growth has begun. A thorough watering at the time of potting or repotting the plants, especially if they are subsequently shaded for a few days, is usually sufficient until they have become established.

The character and bulk of soil should be kept in mind. Porous and warm soils dry out much sooner, while the heavier clay soils are in danger of becoming water-logged and sour, unless watered with care. When there is a large mass of soil in proportion to root development, as in the case of greenhouse beds newly set with young plants, care must be used in watering until the soil is occupied with roots.

Serious trouble often begins in the greenhouse from a heavy watering at the beginning of a period of dark, muggy weather. Not only does such watering do damage to the soil and roots, but the excessive humidity of the air about the plants and its weakening effect upon their tissues, invites the attacks of various mildews, fungi and insect pests.

The time of day is important. In the greenhouse in winter free ventilation is usually impossible. At night there is a tendency toward a damp atmosphere. Careful florists, therefore, water in the early part of the day at this season, so that the house will have become somewhat dried out by nightfall. It is seldom advisable to let plants go into the night with wet foliage. It gives the fungi a chance. Especially hazardous is it to water cutting benches or boxes of young seedlings late in the day in the winter season. The various damping-off fungi find under such treatment the condition suitable for their development. Excessive humidity on the interior of a closed plant-house is most likely to occur in moderate weather. During severe weather the condensation upon the glass is large and renders the air of the house drier. During summer, when there is free ventilation, the watering may advantageously be done late in the day. Midday watering at seasons when

, some of
ater. The
er-tight b
pon the b
d. Soil is
he runs
poured in
tile and i
capillari
1. In bed
s recomm
Arthur
espects,
Here po
l off, are
tom of t
eets that
formed
distribu
the wate
resting
a given
the ben
t some
hrough
the othe
of the b
t results
tering
in the o
us. It
the su
us, car
f down
rigation

ng La
he open
ness. S
ots nea
hen pr
s the b
e heat
likely
etter t
nd if p
then wa

g.—Wh
e plan
ole in
the so
d as
sides
her pl
ry qui
s in sc
han al
half o
ge of
t in
fit is
eed a
anothe
partic
niums
y too

EAF.
ifolia.
ymp
s nig
izani
. Pla
lodea
Sold
dens

LO
Citr
part
ivate
velo

There is probably no country in which the Watermelon is grown to such a large extent as in the United States. All the central and southern states can grow Watermelons to perfection, and there are some of the short-season varieties that thrive well as far north as Ontario. It is always important that light and "quick" soils be selected for the Watermelon, but this is particularly true in the northern part of the country, since the plants must secure a very early start and grow rapidly in order to mature in the short seasons. It is probable that a well-matured Watermelon raised in the North has as good quality as one grown in the South. Some persons believe that seeds from melons grown for several generations in the North give earlier and better results in the North than southern-grown seeds; but the subject yet needs further experiment. However, the Watermelon is generally not so adaptable to the northern parts of the country as the muskmelon is, and is not so largely grown. The Watermelon can be so cheaply grown in the South and the West, and it transports so readily, that there is practically no Watermelon growing for profit in the northern states. Nearly every home garden can grow its own supply. The seeds may be sown directly in the open ground; or, in the northern sections, it is better to start them indoors in transplanting boxes or on sods, as explained under *Muskmelon* and *Transplanting*. It is well, also, in the northern states, to use rather freely of some quickly available fertilizer in the hill, in order to start the plants off early. If the lands are loose and leachy and likely to dry out, or, on the other hand, if they are hard and tend to become lumpy, it is well to make "hills" by mixing one or two large shovelfuls of manure with the earth; but it is important that this manure be short and well rotted and then very thoroughly mixed with the soil. If the manure is coarse and not well incorporated with the soil, the hill is likely to dry out and the fertilizing elements are usually so tardily available that the plant does not get a quick start. The smaller-growing varieties may be planted as close as 6 x 8 feet, but it is customary not to plant them closer than 8 feet either way. In the South, where general field practice is employed, the melons are usually planted about 10 feet apart. The flea beetle and the striped cucumber beetle are likely to be serious on the young plants. Hand-picking and thorough spraying with Bordeaux mixture and Paris green are the most available remedies. In the northeastern states, the Georgia Watermelon is chiefly known, although nearly all parts of the South grow the melon with satisfaction. Lately very large melon industries have developed in Colorado. A very large part of the United States is really well adapted to the commercial growing of the Watermelon.

The common Watermelons are used as dessert fruits. However, there is a race of hard-fleshed very firm melons that are used for the making of preserves (Fig. 2720). Since these are used for the same purposes as the true citron of commerce, they are commonly known as citrons. They come true from seed. L. H. B.

Watermelon Culture in Georgia.—The Watermelon is the only important fruit or vegetable that has no valuable by-products. Its saccharine matter cannot be profitably converted into sugar. Its enormous reservoir of juice or sap refuses to be turned into vinegar or wine, as putrefactive instead of acetic or alcoholic fermentation results. For this reason, also, it does not, like the cantaloupe, produce a good brandy when distilled. Its substance cannot be successfully used in animal nutrition—serving, at best, as a mere diuretic or digestive.

Habitat and Distribution.—Throughout the entire tertiary region of the Atlantic and Gulf states, from the seacoast to a curved line marked by the Piedmont Escarpment which sweeps diagonally southwest from Richmond to Vicksburg on the Mississippi—throughout this vast area—"the land of the long-leaf pine" (and of the wiregrass)—the Watermelon flourishes unrivaled, attaining there its serenest, fullest perfection. And of this area Georgia in particular is noted as producing not only the bulk of the crop shipped to northern trade centers, but the choicest selection as well.

To a certain limit perfection in the melon is found to directly parallel latitude—regulated and modified, of course, by the corrections imposed by isotherms, geological formation and local conditions and environment. Every mile traveled southward from New England toward this limit, which corresponds, practically, to the boundary between Georgia and Florida on the Atlantic slope and to the Brazos river in Texas, the possibilities of the melon enlarge—its size improves, its sugar content increases, its flavor refines and intensifies. Beyond the limit southward, deterioration again begins, progressing with even greater rapidity than in the opposite direction, or northward from the climactic or focal "line of perfection;" so it happens that the melon of extreme South Florida or of the Rio Grandé country is little if any superior to its colder and more impassive sister of New Jersey or Long Island. In this the melon but follows a fixed morphological rule, prominently emphasized by many familiar products of the garden and orchard.

The "line of perfection" referred to—which, indeed, is ultimately reducible to a focal "point" of perfection—is, like the center of population, liable to change as conditions and methods vary or improve under local development. At present this point or center may perhaps be located with more reason at Valdosta, in South Georgia, near the Florida line, than anywhere else. Augusta, however, in eastern Georgia, was formerly considered the great center of southern melon production—its very "throne of empire"—and was, for many years, noted for shipping the largest, choicest and most succulent specimens found in the markets of the North and West.

Varieties.—Twenty years ago, and for many years previous, the tempting if rather startling announcement, "Augusta Rattlesnakes" could be seen invitingly placarded over every progressive ice-dealer's door in all of the big cities of the land. Then crept in the "Kolb Gem," an Alabama product, somewhat superseding, though not displacing the famed "Rattlesnake" as a market favorite, and the public began to prefer the round to the oblong form, though still partial to the "striped rind."

In ante-bellum days, besides the Rattlesnake only two varieties obtained general recognition at the South for excellence—the Lawton and Cuba melons, with their evolved offspring—the former dark green, the latter belonging to the white or gray type (pale green rind with delicate, darker green tracery) but both of them of oblong shape. These were in great measure gradually displaced by the Georgia (or Augusta) Rattlesnake, and it, as stated, was in turn forced to partially yield precedence to the Kolb Gem. The round or ovoid form became fully established in public favor by the later advent of the "Jones" type, which soon dominated the market, its refreshing dark green color proving particularly attractive. Selections of this strain, culminating with Duke Jones, Lord Bacon and others, have finally brought the melon up to its highest perfection, though the Girardeau innovations from Florida, such as Florida Favorite, New Favorite and Triumph, still contest their supremacy, while the older standards, as Rattlesnake, Sugarloaf, Sheephead, Scalybark and the like are by no means "back numbers."

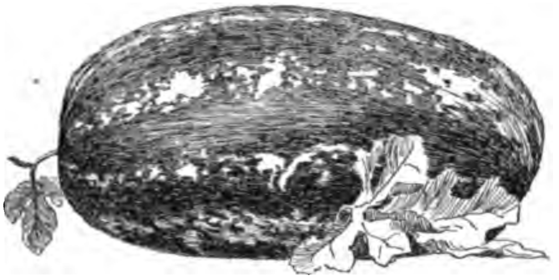
Nor have the North and West been altogether idle in the work of development, many of the best of the recent introductions and some of the older strains coming from these sections. Indiana, for instance, gives us Sweetheart and Hoosier King; Cuban Queen, Delaware and Boss come from the Middle States; while Virginia contributes Jordan Gray Monarch.

Many points combine to form the ideal melon. The scale of excellence for the southern type is probably about as follows:

	Per cent
Shipping capacity	35
Size	25
Productiveness	15
Quality	10
Earliness	8
Shape	4
Color of flesh	2
Color of rind, or marking	1
Total	100

As southern melons are intended, primarily, for sale, a hard, thick rind, with firmness and solidity of flesh, is a paramount requisite, as it makes a safe shipper and long keeper.

Unfortunately, quality, which is based mainly upon a high sugar content, is generally inseparable from a thin rind and tender flesh—contradictory features to those requisite for a good shipper. This accounts for the relatively inferior quality of such melons as Rattlesnake, Kolb Gem and Jones, which are grown, of course, for distant markets. The metropolitan seldom realizes the supreme lusciousness which it is possible for some of the best local varieties in the South to attain unless he has been lucky enough to test them in the field. Even a Lord Bacon, the best of the shipping melons, cannot stand table comparison with Ramsay, Dixie, Jordan Gray Monarch, Kleckley Sweets, McIver Sugar, Phinney Early or Mountain Sweet.



2719. A Georgia Watermelon.

Shape is of minor consideration, if only ordinary symmetry or freedom from distinct deformity is preserved, as preference appears to be divided between the round or ovoid and elongated forms, while the marking or color of rind is of still less moment; although of late a solid green tint seems to find a readier market than either the striped or "gray" marking, while an irregular, blotched surface, as with Scalybark or Mountain Sprout, though attached to good quality and size, is distinctly objected to.

With regard to color of flesh, the public is united in demanding a deep red or crimson heart, with few seeds; for white or golden-fleshed varieties have never found favor. They are generally regarded as wanting in character or insipid, although some melons of this type unquestionably attain superior quality.

Little difference is observable between varieties in their capacity to resist disease and insect depredation. Vigor of growth depends mainly upon individual cultural methods and little upon variety; nor is there much marked difference in time of maturity between the different strains.

Of all the physical features enumerated, size and shipping capacity are by far the most important—together aggregating 60 per cent of the requisites for an ideal type. Size is almost as necessary as resistant rind, and it is fatal to attempt to ship small melons. Results would be far better if stricter culling should be universally followed.

To summarize: For shipping purposes the following varieties may be confidently listed as superior, in the order named: Lord Bacon, Kolb Gem, and Georgia (preferably Augusta) Rattlesnake.

For table or family: Jordan Gray Monarch, Sibley Triumph and Seminole.

For early melons: Memphis, Augusta Sugarloaf and Augusta Rattlesnake.

For late melons: Boss, Scalybark and Sweetheart.

Culture.—While the Watermelon is extremely cosmopolitan and will readily accommodate itself to a variety of soils, and, particularly in its own best region—the "Wiregrass"—will submit to an infinity of rough and unscientific treatment without rebelling, yet a warm, light, gray, sandy soil is its delight, especially when supplemented by a strong clay subsoil that will daily yield its modicum of moisture, little by little, when called on. Like the cat and the grape, the melon cannot bear "wet feet." Still, the soil should not be too dry. Sufficient capillarity must exist to keep the roots of the plants well supplied with their proper amount of moisture—though not enough to evaporate the entire reservoir of water in the subsoil into the atmosphere. A soil too rich in humus is not desirable. Sufficient nitrogen for its use can be supplied artificially where it does not exist naturally. A surplus may, and generally does, produce larger melons, but at the expense of quality. They will prove soft, watery and insipid—poor shippers, and with a small percentage of sugar. Therefore, an ideal location for a melon plat on a small scale will be found on the site of an abandoned cowlot, or an old garden spot. "Second bottoms"—the accumulated detritus of hillsides—serve admirably, but creek bottoms or heavy muck of any sort would be no more admissible for the melon than for grapes or peaches.

Rotation of crop area is all-important. Never should two crops of melons occupy the same plat with an interval of less than three years between them. In that time, insect depredators, attracted by the first melon crop, will probably have become exterminated, and the drain from the soil of specific plant-food (especially potash) will also have been, to a great extent at least, made good.

Preparation of the land should be thorough, but not necessarily deep. The roots of the melon extend quite a distance under ground laterally, but close to the surface. The deeper the land is broken, the deeper the roots will be induced to penetrate, disturbing their normal habit and producing surplus vine at the expense of fruit. But because shallow plowing is permissible, for that very reason the surface pulverization should be thorough and effective. What is saved on the subsoiler should be expended on the harrow. After breaking, two harrowings, one with a cutaway, the other with an Acme harrow, should follow. This leaves the plat in excellent condition, especially if a crop of cow-peas has been grown on the land the previous year, as is always advisable.

The richer the soil or the higher the fertilization, the more luxuriant will be the resulting growth of vines. Hence, the distance apart at which the "hills" should be located must correspond. On very rich land 12 feet apart each way is none too much: indeed, many growers prefer this distance even on poor land. It is entirely a matter for individual control. Probably 10 x 10 feet is the distance most frequently employed, and in no case should it be less than 8 x 8, and this very rarely. Whatever the distance, the land should be checked in squares, locating the hills equidistant in both directions.

Whatever the distance adopted, the plat, after its final "freshening up" with the harrow, is "laid off" with cross furrows made by a light "scooter" plow. Then, in one direction, with a wide "shovel" plow, an opening furrow is run in which the fertilizer is drilled and thoroughly mixed with a scooter—two trips to the row—on which four furrows are next "listed" with a turn-plow, thus forming the bed for planting, which will warm up sooner than the surrounding soil. The "middles" are broken out later.

Many growers still cling to the obsolete practice of dragging up the dirt with a hoe into individual hills at the intersection of the furrows, and therein concentrating the manure, as in garden squash culture, instead of employing the more modern and economical "continuous beds." Where compost is used on a small scale this may be excusable; but it is not only preferable, but on a large scale necessary, to drill commercial fertilizers.

A crop of cow-peas the previous year is the best preparation that can be given an area intended for melons. It leaves the soil well stored with nitrogen, light, porous and easily worked. In midwinter or early spring, according to latitude, the manure, if commercial fertilizer is employed, should be put in; compost or stable droppings sooner, to insure partial decomposition by planting time. Stable manure, however, is always variable in its content of plant-food, and therefore for more reliable results commercial fertilizers are preferable, particularly when operations are conducted on a large scale. The following formula will be found to be well adapted to the average soil:

	Lbs.
Nitrate of soda	500
High grade superphosphate	1,200
Sulfate of potash (or muriate of potash)	300
	2,000

This is rather a high grade formula and will analyze:

	Per cent
Nitrogen (ammonia equivalent 4.0 per cent)	3.3
Phosphoric acid (available)	8.4
Potash (K_2O)	7.5

It may be used advantageously at the rate of from 400 to 800 lbs. per acre; the maximum amount, however, will rarely be justified. An extra finish of nitrate of soda—say a thimbleful per hill—applied just after the plants are well up, will give them a good start.

Planting is performed by hand and the seed put in quite shallow. Seeds should not be spared. Field mice, pigeons, poultry, crows, cockroaches and other depredators frequently prevent a perfect stand where but few seed are used, and the time lost thereby, when replanting is necessitated, can never be regained. Twenty seeds to the hill is not too many—preferably rather more than less—each seed pushed down separately into the mellow soil with the forefinger to the depth of an inch or less. They should on no account be placed deeper. This forces the marauding agency—whatever it may be—to discover and destroy each seed in succession, which gives some a chance to escape; whereas, if planted together in a mass, so soon as the pocket was found the seed would all be scattered or devoured at once. The process of planting as described seems slow and laborious, but it really takes much less time than its details indicate. On dry soil, during a time of drought, it is sometimes necessary to put a "hoe-dab" of earth on each hill, after planting, to serve as a mulch and to induce germination. This is removed before the cotyledons of the young plants appear.

2720. The Preserving Watermelon, commonly known as "Citron."

In addition to starting under glass and transferring to paper (Neponset) pots, in order to have the young plants ready for permanent planting as soon as all danger of frost is over, the growth of the vine, after final transplanting, may be forced by artificial means. A section of small sewer-pipe or tiling is embedded perpendicularly in the hill and nightly draughts of water (liquid manure, if desired, weak, with a solution of phosphates) fed the plant. This stimulates rapid growth in early spring and development of root surface. When acid phosphate is used in solution, the fruit is also said to increase rapidly in size, quantity and quality. Careful thinning to one or two melons per vine will also hasten their growth and development.

"Christmas" melons—should any one care for as cold cheer at that season—may be had by selecting a thick-rinded variety, as Kolb Gem, planting late in June, handling carefully when pulled, and storing in some dry, yielding substance, like cottonseed hulls, in a cool cellar where the temperature is uniform and can never drop below freezing.

After the plants are up they are at first thinned down to three or four to the hill, and subsequently to one, or at most two. One vigorous root system, well attended to, will usually succeed in extracting from the soil as much plant-food as will two, and will give a better account of it, also, on "settling day."

Cultivation is commenced early and should cease early. It is effected with either the five-toothed or eleven-toothed cultivator or with scooter and "heel-scrape," and should invariably be shallow, except for the first plowing after planting, when the middles are customarily "run out" with a turn-plow or "twister." "Laying by," or the cessation of cultivation, should occur as soon as the vines cover the ground well. Vines are never turned at any stage, if it can be avoided, and under no circumstances after "laying by." Nor is the land ever plowed in the early forenoon. To prevent the wind from rolling and tumbling the vines, a thin broadcasting of cow-peas is usually made at the last plowing. They serve also, later, to partially shade the melons and leave the soil in excellent condition for the next crop.

Marketing.—Large areas for shipment are always located directly on some line of railroad—if possible, with a spur or side-track into the plantation. The heaviest servitude attached to melon culture is the initial haul, which should invariably be on springs. A mile's jolt in a springless vehicle discounts profits more severely than a thousand-mile journey, subsequently, in a ventilator car—the mode of shipment now almost exclusively employed where a water route is not convenient. Profits also largely depend on two other considerations: judicious and severe culling, and the proper selection of a market. The first measure cannot be practiced too severely. Undersized fruit is unsalable, and the car-load average is invariably gauged by the smallest melons it contains, as the strength of a chain is measured by its weakest link. Nothing under sixteen pounds should ever leave the field, and it would be better to limit the minimum weight to twenty pounds. Anything over thirty pounds ranks as large, over forty quite large, and melons reaching fifty pounds are of the first rank, although it is not uncommon to meet with monsters of sixty, seventy or even eighty pounds, while occasionally a phenomenally big one tops the hundred mark. It is believed that the largest melon on record (officially) attained the weight of 124 pounds. This was grown near Decatur, Ga., some twenty years ago—outside the established "Melon Belt."

In shipping, the smaller melons should occupy the floor of the car, with the larger forming the upper tiers—not for the purpose of deception or for the sake of appearance, but because the smaller sizes better withstand jolting and pressure and there is also less loss if they are injured.

As the importance of avoiding glutted markets is self-apparent, and the judicious selection of his point of shipment means to the grower success or failure, it follows that shipping associations are almost an absolute necessity—the ordinary planter who depends on his individual judgment generally "going to the wall." The "Shippers' Unions," however, are usually able to cope successfully with the problem and manage to distribute the season's crop over the country in such manner as to leave a living profit to the planter. Yet the industry is now by no means so remunerative as formerly. Supply seems to more than equal demand, and great complaint is made by the grower of excessive freight charges, while the transportation lines insist that their rates at present figures are not profitable. And yet the grower still continues to plant his melons, the railroads to haul, and the public to purchase them!

Affections and Remedies.—After a stand is once obtained—spontaneously and promptly—and this, when all is said, is perhaps the main problem underlying successful melon culture—its affections are comparatively few and simple. Indeed, the Watermelon may be said to be free from any vital disease, and its maladies are almost entirely confined to those resulting from the attacks of a few insect pests, as follows:

1. The melon worm (*Margaronia hyalinata*).—A

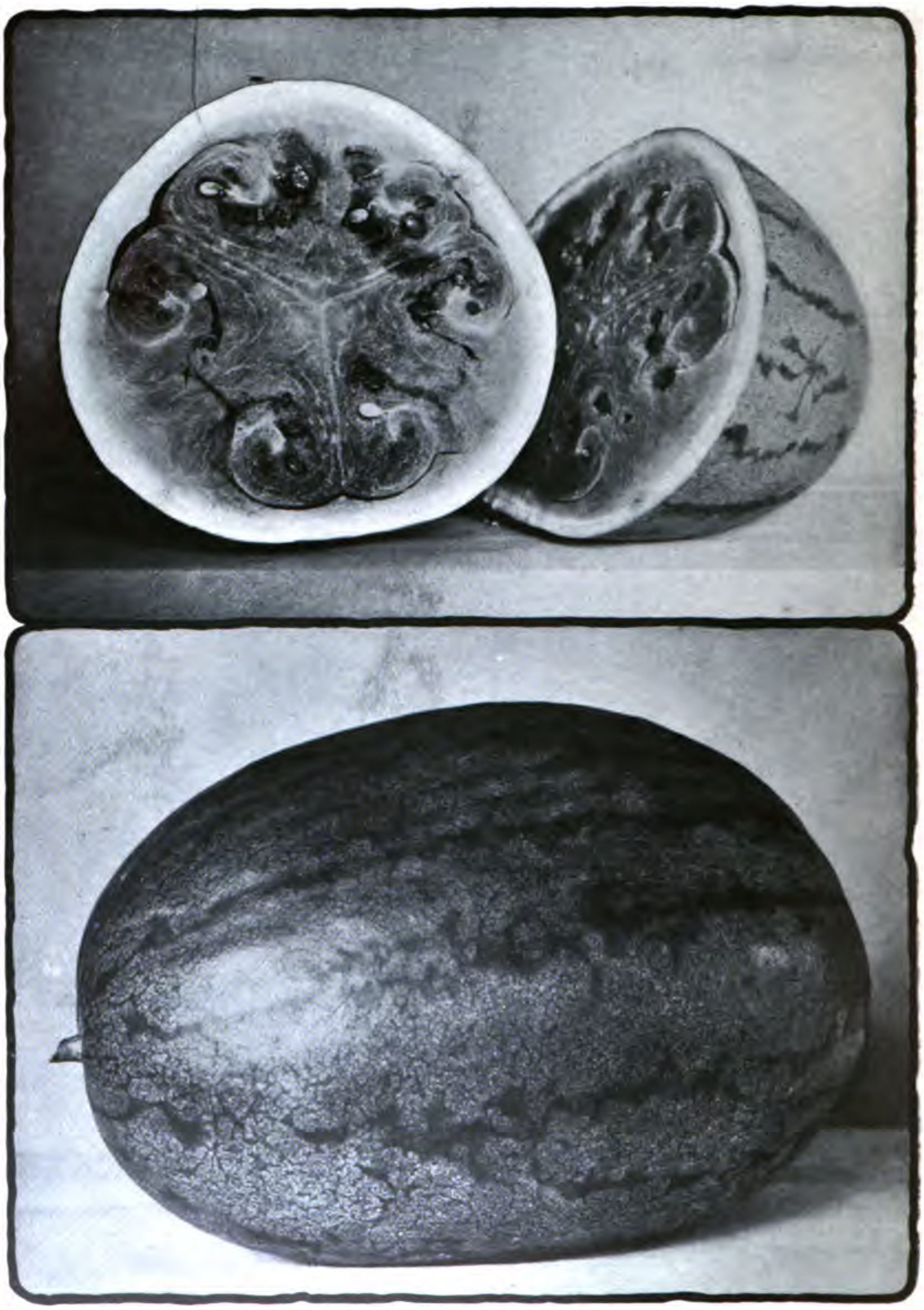


Plate XLIX. Watermelons.—The Orange variety.

small moth, the larvæ of which, light, yellowish green caterpillars about an inch long, destroy only the leaves of the Watermelon, but both the foliage and fruit of the cantaloupe or muskmelon. They are "chewers," not "suckers."

2. The melon louse (*Aphis gossypii*).—This attacks the foliage, only, in the form of the adult—a small winged green fly, viviparous, whose wingless progeny attain maturity in about a week from birth, and begin to reproduce.

3. The striped cucumber beetle (*Diabrotica vittata*).—A small black and yellow-striped beetle, a quarter of an inch long, appearing in spring and attacking the young plants as they emerge from the ground, its larvæ at the same time destroying the roots.

4. The flea beetle (*Crepidodera cucumeris*). Diminutive, like all of its kind, but very active, feeding on the young plants in spring, after maturing under rubbish and stones. The adult insect eats the upper surface of the leaves, in irregular patches, and the larvæ are said to burrow their way through the interior of the leaf structure under the surface.

Remedies: The commercial grower is generally prepared to accept the fact that none of these pests is going to neglect him, and therefore makes his preparations to combat all, separately and collectively, and so plans his schedule as to cover the entire list. The following is a detail of the operations advised:

1. Apply a pinch of nitrate of soda to each hill as soon as the young plants are up to insure full vigor and power of resistance to all enemies as they arrive upon the scene.

2. For the melon worm, striped cucumber beetle and flea beetle, spray with Paris green—4 ounces to 50 gallons of water—for two or three sprayings, at intervals of a week apart.

3. Spray intermediately, at intervals of a week (midway between the arsenite applications) if the melon louse is found to have located on the plants, with a 1 to 20 mixture of kerosene and water (using Weed kerosene attachment to sprayer) or with kerosene emulsion, same strength. Whale-oil soap, 1 lb. to the gallon, may be substituted for the kerosene treatment in ordinary cases, but when obdurate resort must be had to carbon bisulfide, a teaspoonful to the hill, in box-tops, clam-shells or cheap vessels of any kind, under canvas-hooped covers. This remedy is unfailing, but somewhat troublesome, and is only justified when the commercial grower is fighting desperately for his crop and livelihood. A detail of the methods of preparing the remedies here suggested may be obtained from the article on *Insecticides*, in Vol. II of this work, which see.

HUGH N. STARNES.

WATSÒNIA (Sir Wm. Watson, M.D., 1715–1787, electrician and professor of botany at Chelsea). *Iridàceæ.* A genus of 16 species of tender bulbous plants, one from Madagascar, the others from the Cape of Good Hope. They bloom from July to September and have scarlet, rose or white 6-lobed flowers, with usually a long, slender tube which is bent near the base. Watsonias are very much like Gladioli, having the same kind of a corm, the same sword-shaped, rigid lvs., the same kind of a spike and the same season of bloom. It is, therefore, a great mistake to suppose that they are suited only to greenhouse cultivation. The main differences between Watsonia and Gladiolus, from the horticultural as well as botanical points of view, are the longer tube and regular flower of Watsonia; three of the six perianth-segments in Gladiolus being usually different in size, shape and direction of spread. An important botanical difference is that the style-branches of Watsonia are simple, while those of Gladiolus are bifid.

Great interest has been aroused in Watsonias recently by the introduction of the "White Watsonia," known to the trade as *W. Ardernei*. The plant might be roughly described as a white Gladiolus. It is likely to receive considerable attention within the next few years. It grows 3 or 4 ft. high, strong specimens being branched, and bears about a dozen fls., each 2½–3 in. long and about 2 in. across. The purity of its color and its value for cutting make it of exceptional interest to florists. There are other white-fld. forms of Watsonia, but none of them seem to be in the American trade. Pure white is the exception in the iris family, while it is a common, if not dominant, "color" in the lily and amaryllis families.

The White Watsonia has acquired so many names that a short historical sketch of the plant is desirable. All the stock in the trade at present is supposed to be descended from plants cultivated by H. W. Arderne, of Cape Town. The original bulb was found 80 miles away in a peat bog amongst thousands of the common pink-fld. kind. In Oct., 1892, Mr. Arderne had 400 spikes in bloom and in March, 1893, some of his plants were pictured in The Garden under the name of *Watsonia alba*. However, a pure white-fld. form had been previously found near Port Elizabeth and a bulb sent to J. O'Brien, of Harrow, flowered in England in 1889 and was then fully described as *W. iridifolia*, var. *O'Brieni*, the name adopted in this work. In the recent discussions of the plant the fact has been overlooked that T. S. Ware, of Tottenham, cultivated a white variety in 1880, it being figured in The Garden for that year as *Watsonia alba*. A nearly white form was cultivated in England as early as 1801, but the tube was pinkish outside and there was a rosy spot at the base of each perianth-segment.

William Watson, of Kew, was the first to emphasize the close horticultural parallel between Watsonia and Gladiolus and to urge the whole group upon the attention of the plant-breeder. This suggestion, coming from the man who may be said to have created the modern Cape Primrose or Streptocarpus, should result in another fine race of hybrids before many years. However, the Watsonia "bulb" is not so easily and safely stored as that of Gladiolus.

Generic characters: perianth with long, curved tube, the lowest and narrowest part ascending a short distance above the calyx; the tube is then dilated into a cylindrical or funnel-shaped portion which bends down, usually at a sharp angle; segments equal, oblong, spreading; stamens unilateral, arcuate, inserted below the throat of the tube. Baker, Handbook of the Irideæ. Flora Capensis, vol. 6.

INDEX.

alba, 4.
aletroides, 1.
angusta, 2.
Ardernei, 4.
coccinea, 6.
densiflora, 5.
fulgens, 2.
humilis, 7.
iridifolia, 4.
Meriana, 3.
O'Brieni, 4.
rosea, 8.

A. *Upper part of tube cylindrical or narrowly funnel-shaped.*
B. *Length of perianth-segments ⅓–½ in.* 1. **aletroides**
BB. *Length of perianth-segments ¾–1 in.*
C. *Stems tall, 3–4 ft., often branched.*
D. *Spikes lax, 12–20-fld.*
E. *Fls. scarlet*.................... 2. **angusta**
EE. *Fls. rose-red or white.*
F. *Lvs. ½–¾ in. wide: spikes about 12-fld*................ 3. **Meriana**
FF. *Lvs. wider: spikes denser, about 20-fld*................ 4. **iridifolia**
DD. *Spikes dense, 30–50-fld*.......... 5. **densiflora**
CC. *Stems shorter, mostly 1–2 ft., unbranched.*
D. *Tube 1½–2 in. long*............. 6. **coccinea**
DD. *Tube 1¼–1½ in. long*........... 7. **humilis**
AA. *Upper part of tube short and broadly funnel-shaped*....................... 8. **rosea**

1. **aletroides**, Ker. Bright scarlet or pale pink-fld. species, 1–2 ft. high, remarkable for the short perianth-segments: stem simple or branched: spikes 6–12-fld. B.M. 533 (rosy scarlet, splashed with cardinal, the inner segments white at the tip).

2. **angùsta**, Ker. (*W. iridifòlia*, var. *fùlgens*, Ker.). Scarlet-fld. species distinguished from *W. Meriana* by the color of the fls. and by the shape of the perianth-segments. In *W. angusta* the segments are decidedly acuminate, while those of *W. Meriana* are more nearly oblong and come to a point suddenly. Also the style of *W. angusta* reaches to the tip of the perianth-segments, while in *W. Meriana* it does not. B.M. 600. Gn. 17:230 (as *W. Meriana*, var. *coccinea*), 44:923.

3. **Meriàna, Mill.** This seems to be the dominant species of the genus and hence the most variable and the one most interesting to the plant-breeder. In its widest sense it includes *W. iridifolia*, but for horticultural purposes it will be convenient to consider the latter a distinct species. *W. Meriana* is best restricted to the commonest type at the Cape, which is a rose-fld. species 3–4 ft. high, the stem usually branched, lvs. ½–¾ in. wide and the spikes 12–20-fld. This is the plant figured in B.M. 418 as *Antholyza Meriana*. Gn. 17:230 is more typical in color. The white-fld. form, which is rarer in nature, is treated under *W. iridifolia*. Baker says that there are scarlet-fld. forms of this species, but he gives them no name, and it is probable that all such should be referred to *W. angusta*.

4. **iridifòlia,** Ker. This is treated by Baker as a variety of *W. Meriana* characterized by broader lvs. than the type: fls. closer and more numerous, white or pinkish. For horticultural purposes it will be convenient to treat it as a distinct species and restrict the name to the pink or rose-colored type.

Var. **O'Brieni,** N. E. Br. (*W. álba*, Hort. *W. O'Brieni*, Mast. *W. iridifòlia*, var. *alba*, Wm. Robinson. *W. Ardernei*, Hort. *W. Meriana*, var. *alba*, Hort.). WHITE WATSONIA. A variety with pure white fls. discussed above. Gn. 17:230; 43, p. 229; 51, p. 284. J.H. III. 29:219. G.C. III. 11:305; 19:143. A.G. 20:573.

5. **densiflòra,** Baker. This very distinct and handsome rose-colored species more nearly resembles a gladiolus than any other by reason of the density and regularity of its pyramidal inflorescence. Stems unbranched, 2–3 ft. high: spikes a foot long: fls. bright rosy red. B.M. 6400.—There is a choice variety with pure white fls. Var. **álba,** Hort., was introduced as early as 1891.

6. **coccínea,** Herb. This showy scarlet-fld. species differs from *W. Meriana* in its stem being shorter and unbranched, the spikes fewer-fld. and the styles a trifle longer. Stem 1 ft. high: spikes 4–6-fld. B.M. 1194 (*W. Meriana* variety).

7. **hùmilis,** Mill. This species has rose-red fls. apparently the same size and color as *W. densiflora* but only 4–6 in a spike and the stem only a foot or so high. B.M. 631.—A variegated form figured in B.M. 1193 as *W. roseo-alba* has a spike of 8 flesh-colored fls. with broad bands and splashes of scarlet.

8. **ròsea,** Ker. Robust rose-colored species, growing 4–6 ft. high and the fls., though fewer than those of *W. densiflora*, are perhaps capable of greater size. Spikes about 15-fld. B.M. 1072.

W. argùta, Hort. John Saul, 1893, is presumably a catalogue error, as no such name appears in Baker's latest monograph.

W. M.

WATTLE. See *Acacia*.

WAX BERRY. *Symphoricarpus*. **W. Flower.** See *Hoya*. **W. Palm.** Consult *Diplothemium*. **W. Plant.** *Hoya carnosa*. **Waxwork.** *Celastrus scandens*.

WAYFARING TREE. *Viburnum Lantana*.

WEATHER PLANT. See *Abrus*.

WEEDS. It would have been a sorry thing for agriculture if there had been no weeds. They have made us stir the soil, and stirring the soil is the foundation of good farming. Even after we have learned that crops are benefited by the stirring of the land, we are likely to forget the lesson or to be neglectful of it unless the weeds constantly remind us of it. Necessity is always the best schoolmaster; and of these necessities, weeds are amongst the chief.

A weed is a plant that is not wanted. There are, therefore, no species of weeds, for a plant that is a weed in one place may not be in another. There are, of course, species that are habitual weeds; but in their wild state, where they do not intrude on cultivated areas, they can scarcely be called weeds. The common pigweed and the purslane are sometimes vegetables, in which case potato plants would be weeds if they grew among them.

The one way to destroy weeds is to practice good farming. Judicious tillage should always keep weeds down in cultivated lands. In idle lands weeds are likely to be a serious nuisance. In sod lands they are also likely to take the place of grass when for any reason the grass begins to fail. The remedy for weeds in grass lands, therefore, is to secure more grass. In order to do so, it may be necessary to plow the land and reseed. In some cases, however, it is only necessary to give the land a light surface tillage, to add clean and quickly available fertilizers and to sow more grass seed. This is the fundamental remedy for weeds on lawns. If such weeds are perennial, as dandelion and plantain, it is advisable to pull them out; but in order to keep them out, a stiffer sod should be secured. The annual weeds that come in the lawn the first year are usually destroyed by frequent use of the lawn mower.

Foul lands may usually be cleared of weeds by a short and sharp system of rotation of crops, combined with good tillage in some of the crops of the series. When the land for any reason is fallow,—as when it is waiting for a crop,—surface tillage with harrows or cultivators will serve to keep down the weeds and to make the land clean for the coming crop. Often lands that are perfectly clean in spring and early summer become foul in the fall after the crops are removed. Cleaning the land late in the season, therefore, may be one of the most efficient means of ridding the land of weeds. Coarse and rough stable manure, which is not well rotted, may also be a conveyer of weed seed. The seeds of weeds are sometimes carried in the seed with which the land is sown, particularly in grass and grain seeds.

It does not follow that weeds are always an evil, even when they are abundant. In the fall a good covering of weeds may serve as an efficient cover-crop for the orchard. They are likely to entail some extra care the next year in order to prevent them from gaining a mastery, but this extra care benefits the orchard at the same time. It is, of course, far better to sow the cover-crop oneself, for then the orchardist secures what he wants and of the proper quantity and at the right season; but a winter cover of weeds is usually better than bare earth.

From the above remarks it will be seen that weeds are scarcely to be regarded as fundamental difficulties in farming, but rather as incidents. In the most intensive and careful farming the weeds bother the least. There should be a careful oversight of all waste areas, as roadsides and vacant lots. Experience has shown that the greatest difficulty arises on commons and waste land, not on farms.

Weeds are often troublesome in walks, particularly in those made of gravel. If the walk were excavated two feet deep and filled with stones, rubble or coal ashes, weeds cannot secure a foothold. It is particularly important that gutters be not laid directly on the soil, else they become weedy. There are various preparations that can be applied to walks to kill the weeds, although, of course, they also kill the grass edgings if carelessly applied. Strong brine, applied hot, is one of the best (1 lb. of salt to 1 gal. of water). There are also preparations of arsenic, vitriol, lime and sulfur.

L. H. B.

WEEPING TREES. Consult *Trees*.

WEIGELA. Referred to *Diervilla*.

WEST INDIA RATTLE BOX. *Crotalaria retusa*.

WESTERN CENTAURY. *Hesperochiron*.

WESTRÍNGIA (J. C. Westring, physician and author). *Labiàtæ*. An Australian genus of 11 species of shrubs with entire whorled leaves and solitary, 2-lipped, white or purple-spotted flowers in the leaf-axils or rarely in terminal heads. Calyx bell-shaped, 5-toothed; corolla with a short tube and dilated throat: the upper lip flat and broadly 2-lobed, the lower 3-lobed: fertile stamens 2: staminodia 2, short.

rosmariniförmis, Sm. VICTORIAN ROSEMARY. A bushy shrub with the branches and under side of the leaves silvery white with appressed hairs: lvs. in whorls of 4, oblong-lanceolate to linear, ½-1 in. long: fls. white, axillary, almost sessile; calyx 3 lines long; corolla not twice as long as the calyx. Sandy hills, near the sea-coast. Australia.—Offered in S. Calif.

F. W. Barclay.

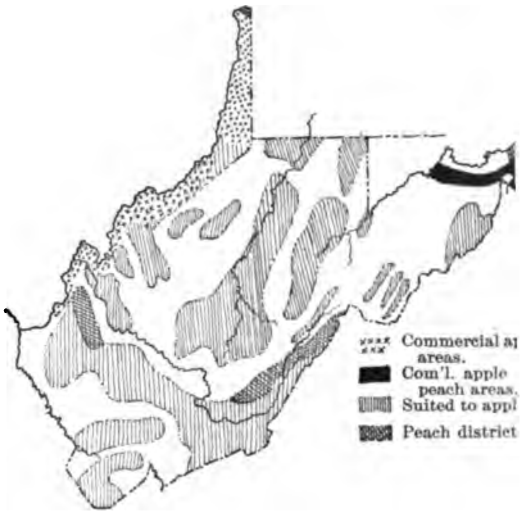
WEST VIRGINIA HORTICULTURE (Fig. 2721), like that of most other states, had its beginning as a side issue of the usual operations of the farm. In fact, even to-day it is considered as a sort of complement to grain-growing or stock-raising in most sections of the state. In some localities where towns have sprung up as the result of coal, oil or railroad operations, the demand for vegetables and small fruits has been largely met by local producers. The market-garden work, aside from the growing of watermelons, peas and tomatoes, is such as has been encouraged by the growth of the neighboring towns. Melon-growing, which has an extensive acreage along the Ohio river bottom, is the only branch of vegetable-gardening which seeks markets outside the state. What has been said of vegetable-gardening applies equally well to small-fruit culture, but the tree fruits—notably apples and peaches—fall under quite a different category.

The apple industry in West Virginia is chiefly of two characters and has two regions,—the lower, and the northern Ohio valley counties of the state. The former region gives considerable attention to the production of early apples for the northern markets. Several early harvest varieties are grown, Yellow Transparent, Red Astrachan and Pomme Royal predominating; these are followed by Maiden Blush, Grimes Golden and Rome Beauty. Because of the favorable climate in this region, the production of this class of fruits has grown to be a profitable, although not a large industry. The northern Ohio river valley counties, including what is known as the Northern Panhandle, and the counties in the eastern part of the state, bordering on the Potomac, form the present areas for the commercial growing of winter apples.

The Hancock county orchards (northern end of Panhandle) are unique in storage facilities. Here nearly every grower with any considerable acreage (fifty or more acres) is provided with a storage-house, so that in seasons of greatest fruit production there is sufficient capacity for storing the crop. Previous to the fall of 1896 all the houses were constructed of stone and provided with ice chambers for maintaining artificial cold. In 1896 one house was built of wood on the principle of confined air between walls constructed of wood and paper. In this house, which has been used two years, no ice is carried, and good results have followed. These houses are of various capacities, ranging from 2,500 up to 35,000 barrels.

The plan most in vogue is to have the fruit removed from the trees by expert pickers, placed in barrels in the orchard, headed and then transferred immediately to the storage-house. In general, the barrels are stored in tiers on the side. They are left in this position until shipping season arrives, which usually begins in March or early April and extends well into May. Before shipment each barrel is opened, the contents placed in a sorter and the fruits carefully assorted and graded. The barrels are stenciled with the grower's trade-mark and with the grade of the fruit. Through a series of years these practices have been strictly adhered to and as a result the fruit, the bulk of which goes south and west, has a reputation in the markets to which it finds its way. This region along the upper Ohio is peculiar also in possession of a variety suited to its climate and to the practices of the growers. This is known as the Willow Twig, an apple of good size, good appearance and fair quality, a long keeper and a good cooker. Willow Twig and Ben Davis yield the greater part of the crop of this region, although among varieties of minor importance the Rome Beauty and Bentley Sweet are some of the best.

The varieties chiefly grown in the eastern counties differ quite as much from those of the Hancock region as do the varieties of New York. In the eastern counties York Imperial or Johnson Fine Winter is the variety upon which most dependence is placed. It is not only a sure cropper, but is a good market variety, possessing high color with good flavor and fair keeping
qualities. It is one of the ten varieties included
Taylor in his export list. This variety, placed in st
in October, can be moved from the cold room in F
ruary, with little or no shrinkage from loss of moist
and an equally small loss from decay. Ben Davis he
as well as in Hancock county, forms a valuable seco
although the crop is better in the northern than in
eastern counties. Among fall varieties for both secti
of the state none exceeds the Grimes Golden. T
apple, as well as the Willow Twig, is a native of



2721. West Virginia, to illustrate the pomological regions

state. Another apple belt in which young orchards gi
much promise lies at the extreme southern border
the state.

Peaches thrive in various sections of the state.
fact, hardly a locality is without its supply; but stran
to say, in many instances the trees are chance seedling
and the quality of the fruit is correspondingly low.
the five counties bordering upon the Potomac, howeve
the industry has grown to important commercial pr
portions. The orchards under the control of the All
gheny Orchard Company aggregate nearly 150,000 tree
Besides this there are numerous private enterpris
with orchards ranging from 500 to 5,000 trees. T
most successful orchards are situated upon the fir
terrace of the mountain, usually three to five mil
from the Potomac, and at an elevation of from 900
1,500 feet above tide. The soil is gravelly in natur
resulting from the breaking down of shale and sand
rocks. The methods of the Orchard Company abo
mentioned mark a new era in the manner of handlin
the peach crop. Instead of sending their product
some commission house to be again scattered over th
country to the small towns, this company has a hea
office in the city of Cumberland, and from there, as
distributing point, peaches go direct to the dealers
the small towns and cities, the commission of the mi
dleman is saved, the retailer gets a fresh product dire
from the orchard, and the consumer is provided with
better article.

In West Virginia, where lack of transportation
often an obstacle, canneries are valuable as furnishin
a market for horticultural products. In the city
Wheeling there are three extensive pickling and ca
ning factories where large quantities of cucumber
tomatoes and onions, as well as various fruits, are pr
pared for winter consumption. In Martinsburg, in co
nection with the cold storage house already mentioned
a modern cannery of large capacity is operated, whic
furnishes an annual market for the products of bot
orchards and gardens. Besides these there are severa
smaller concerns which confine their packing to one o
at most to two vegetables, tomatoes being the favorite

It becomes evident that a state with the limited territory of West Virginia must have some other compensating feature to render it capable of such varied products. A glance at its geographical location, at the varied altitudes and exposures, is sufficient to account for the variety of climate. Persimmons, papaws and watermelons thrive on the lowland, cranberries on the mountain glades, and in the higher altitudes the huckleberry finds a congenial home. Huckleberries are annually gathered in great quantities both for domestic uses and for shipment. Certain local areas are expressly adapted to the cultivation of sweet cherries, others to pears of the better sorts, and nearly every corner of the state furnishes ideal conditions for the blackberry and dewberry —the Lucretia dewberry being a native.

The mountainous character of the state has been a barrier to cheap railroad construction, and as a result facilities for moving perishable products are not good, and to-day lack of railroad facilities is the greatest check to commercial horticulture. L. C. CORBETT.

WHAHOO or **WINGED ELM** is *Ulmus alata*.

WHEAT. See *Triticum*.

WHEAT, INDIA. *Fagopyrum Tataricum*.

WHIN. See *Ulex*.

WHÍPPLEA (Lieut. [afterward General] A. W. Whipple, commander of the Pacific Railroad Expedition from the Mississippi to Los Angeles in 1853–54). *Saxifragàceæ*. A genus of one species, a trailing subshrub with clusters of small white fls. which soon become greenish. The clusters have 4–9 fls. and the petals are a little more than a twelfth of an inch long. The plant blooms in March and April and is native to woods in the Coast Ranges of Calif. **W. modésta,** Torr., was offered in the East for western collectors in 1881, but the plant is horticulturally unknown. It is fully described in Bot. Calif. and in Jepson's Flora of Western Middle California.

WHITANIA. Catalogue error for *Withania*.

WHITE ALDER. Sometimes applied in America to *Clethra alnifolia*. **White-and-Blue Flower** is *Cuphea Llavea*. **White Cedar.** *Chamæcyparis sphæroidea*. See also *Thuya*. **W. Cup.** *Nierembergia rivularis*. **W. Hellebore.** *Veratrum*. **W. Thorn.** *Cratægus*. **Whiteweed.** *Chrysanthemum Leucanthemum*. **Whitewood.** Tulip-tree and Linden (*Liriodendron, Tilia*).

WHITFIÈLDIA (after Thomas Whitfield, intrepid naturalist who made several explorations into tropical western Africa and brought back many choice plants). *Acanthàceæ*. A genus of 2 species of tropical African herbs, one with white, the other with brick-red flowers. The latter is a bushy evergreen plant with numerous branches terminated by racemes of about 8 dull red fls. each an inch long. The calyx and corolla and often the large bracts are all colored alike. This species has been considered a desirable stove plant, and the first specimen known to cultivation bloomed from October to March. It is, however, practically unknown in America. It has been catalogued in the American trade, but seems to be little known.

Generic characters: calyx 5-parted; segments colored, oblong or lanceolate; corolla-tube swelled almost from the base, or slender and cylindrical below and abruptly inflexed above, widening into a bell-shaped throat; lobes 5, ovate or oblong-lanceolate; stamens 4, didynamous.

lateritia, Hook. Tender, evergreen, red-fld. subshrub about 3 ft. high: lvs. opposite, entire, ovate or oblong ovate, wavy: corolla between bell- and funnel-shaped. Western Trop. Afr. B.M. 4155. F.S. 1:36. W. M.

WHITLÀVIA. See *Phacelia*.

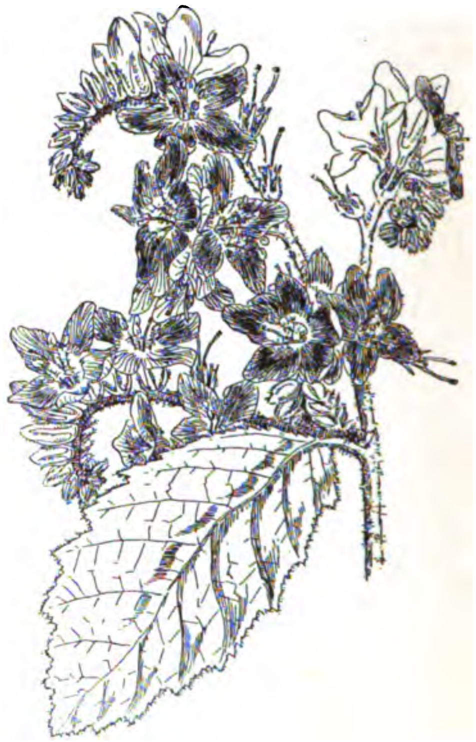
WHITLOW GRASS. *Draba*.

WHITLOW-WORT. See *Paronychia*.

WHORTLEBERRY. See *Vaccinium*.

WIDDRINGTÒNIA (Capt. Widdrington, formerly Cook, who traveled in Spain). *Coniferæ*. **W. Whýtei,** M. Wood, is a coniferous tree from southeastern Africa, probably not hardy N. It grows at an altitude of 5,000 to 7,000 ft. on Mt. Milanji in Nyassaland and is known as the Milanji Cypress or Cedar. Seedlings of it were first cultivated in 1894 at Kew, and plants have recently been offered in Calif. According to Davy, it is proving to be quite hardy near San Francisco. The wood is dull reddish white, strongly aromatic, and locally used for furniture and for doors and windows. The tree attains a maximum height of 140 ft., with a girth of 5⅙ ft. at a point 6 ft. above the ground, the trunk being clear for 90 ft. The species has glaucous, linear, juniper-like foliage and a cone smaller than a chestnut and longer than broad. Widdringtonia is considered by Bentham and Hooker as a subgenus of Callitris. Franceschi, however, reports that it has proved quite delicate to raise in S. Calif.

WIGÁNDIA (Johannes Wigand, Pomeranian bishop; wrote on plants in 1590). *Hydrophyllàceæ*. About 7 species of tall, coarse perennial herbs or subshrubs native to mountainous regions from Mexico to the Argentine Republic. The fls. are 5-lobed, mostly violet, 1–1½ in. across and borne to the number of 30 or more in lax, terminal, cymose panicles. Wigandias are chiefly valued as foliage plants for subtropical bedding, because of their very showy character. Their leaves are covered with stinging hairs, similar to nettles. Many large specimens may be seen in California, but the plants are considered to be rather coarse and straggling.



2722. Wigandia Caracasana (× ¾).

They are generally raised from seed every year, the seed being started indoors as early as January. The plants attain a height of 6–10 ft. in a single season. They are unsatisfactory greenhouse plants, as they do not grow vigorously indoors. The roots may be kept over winter in a frostless place and stock may be secured in spring by cuttings.

Wigandias have large, alternate, wrinkled lvs. with doubly crenate margins and lax, terminal, cymose panicles, the branches of which are 1-sided spikes or racemes: calyx-segments linear; corolla broadly bell-shaped, with a short tube and 5 spreading lobes; stamens 5, usually exserted: styles 2, distinct at base: capsule 2-valved: seeds small and numerous, pitted-wrinkled.

The species of Wigandia are endlessly confused in current reference books, as well as in the trade, and Index Kewensis reflects the general perplexity. The following account is based upon André's revision of the genus in R.H. 1861:371, with an important change in the name of one species which requires a somewhat tedious explanation. In respect to *W. urens*, André follows the previous revision by Choisy in DC. Prod. 10:184. The name *Wigandia urens* was first used by Kunth, who applied it to a Mexican plant. Before this, however, another plant of the same family but a native of Peru had been called *Hydrolea urens*. Now when Choisy came to monograph the whole family he transferred *Hydrolea urens* to the genus Wigandia and called it *Wigandia urens*, Choisy. He, therefore, had to invent a new name for the Mexican plant, and this he called *Wigandia Kunthii*. Choisy's action would be approved by the radical school of American botanists, but not by the international rules of nomenclature known as the Paris Code of 1867. Hence it is necessary to give the Peruvian plant a new name, and it is here called *W. Peruviana*. The "common" or English names suggested below may be convenient in explaining the difficulties of the genus. (Kunth=HBK.)

A. *Color of fls. lilac or violet.*
  B. *Spikes 1-sided but 2-ranked, the fls. pointing in two directions.*
    C. *Plant with rusty hairs* .... **macrophylla**
    CC. *Plant without rusty hairs* .... **Peruviana**
  BB. *Spikes 1-sided but not 2-ranked, the fls. all pointing in one direction.*
    C. *Capsule densely hairy* .... **urens**
    CC. *Capsule slightly hoary-pubescent* .... **Caracasana**
AA. *Color of fls. wine-red* .... **Vigieri**

macrophylla, Cham. & Schlecht. LARGE-LEAVED WIGANDIA. Tender Mexican perennial plant, attaining a height of 6 ft. or more in a season when treated as a subtropical bedding plant: plant covered with two kinds of hairs, long white, stiff, spreading, prickly ones and short rusty hairs: only the lower surface of lvs. covered with a thick, white felt: spikes 1-sided, 2-ranked: fls. violet, with a white tube. R.H. 1861:371.—The above is André's conception of the species, but some writers would make it a variety of *W. urens*, Kunth. The lvs. attain nearly 3 ft. in length under perfect conditions. Lvs. oval-elliptic, base more or less heart-shaped.

Peruviàna (*W. ùrens*, Choisy, not Kunth.). PERUVIAN WIGANDIA. Tender Peruvian subshrub, distinguished by the absence of rusty hairs and by the 2-ranked spikes of violet flowers. Very hispid with long, stiff, spreading hairs: lvs. 5–6 in. long in their native place, ovate-cordate, covered with a white felt below. R.H. 1867, p. 470 (same as N. 4:208; doubtful).

ùrens, Kunth, not Choisy (*W. Kùnthii*, Choisy). MEXICAN WIGANDIA. Tender Mexican subshrub, distinguished by its 1-sided but not 2-ranked spikes of violet fls. and densely hairy capsule. Very hispid: lvs. ovate-cordate, pilose on both sides, rusty hairy above.

Caracasàna, Kunth. VENEZUELAN WIGANDIA. Fig. 2722. Tender Venezuelan subshrub, distinguished by its 1-sided but not 2-ranked spikes which are revolute at the apex and by the capsule which is merely hoary-pubescent. Hairy: lvs. elliptic-cordate, hairy on both sides, rusty-hairy above: fls. pale violet or lilac. B.M. 4575 (adapted in Fig. 2722). B.R. 23:1966. F.S. 8:755 (page 17). Gn. 4, p. 503; 8, p. 198. R.H. 1859, p. 653. (The first three pictures are authentic.—The lvs. are longer and more acute than those of *W. urens*. It is probable that the plants cult. under this name are really *W. macrophylla*. André found it so in 1861, and the trade is conservative about changing names.

Vigièri, Carr. Imperfectly described species of unknown nativity. Carrière merely said it was a silvery plant instead of somber and glutinous "like *W. Caracasana*" (by which he perhaps meant *W. macrophylla*). Nicholson says the fls. are lilac-blue, passing through vinous red to fawn-color before fading. In the American trade the red color of the fls. is considered distinctive. N. 4:209.

W. M.

WIKSTRŒMIA (after a Swedish botanist). *Thymelæàceæ*. *W. pauciflora* is offered by importers of Japanese plants. "From its bark the celebrated Japanese copying paper is made." Wikstrœmia is a genus of about 20 species of trees or shrubs native to tropical and eastern Asia, Australia and the Pacific islands. Lvs. opposite, rarely alternate: fls. hermaphrodite, in terminal racemes or spikes; perianth-tube long; lobes 4, spreading; stamens 8, in 2 series; filaments short; disc of 1–4 scales: ovary villous, 1-loculed; style short; stigma large, globose: fr. fleshy and naked or more or less included in the base of the perianth.

canéscens, Meissn. (*W. pauciflòra*, Franch. & Sav.). Small shrub, 1–3 ft. high: lvs. 1–3 in. long, thin, alternate and opposite, oblong-lanceolate: perianth 3–4 lines long: fr. silky. Himalayas, Ceylon, China.

WILDER, MARSHALL PINCKNEY (Plate XLI), distinguished amateur pomologist and patron of horticulture, died at his home near Boston, Dec. 16, 1886, in his eighty-ninth year. He was born at Rindge, N. H., Sept. 22, 1798. His inherited love of country life soon showed itself, and at the age of sixteen he chose farm work in preference to a college course. At twenty-seven he moved to Boston, where he was long known as a prosperous merchant and president of many societies and institutions. His active interest in horticulture may be dated from 1832, when he purchased a suburban home at Dorchester, where he lived for more than half a century. His pear orchard at one time contained 2,500 trees, representing 800 varieties. During his life he tested 1,200 kinds of pears and in 1873 he exhibited 404 varieties. He produced several new pears. In 1844 he introduced the Anjou. He imported many fruits and flowers new to America, and from 1833 to the end of his life he was constantly contributing to the society exhibitions the products of his garden. He carried a camel's hair brush in his pocket and was always hybridizing plants.

He delighted in floriculture, and his camellia collection, comprising at one time 300 varieties, was the best in America. He raised many new kinds of camellias, though he lost 500 seedlings by fire. His *Camellia Wilderi* he sold to florists for $1,000. He also had a notable collection of azaleas. As early as 1834 he produced a double California poppy. Among the many floral novelties which he was first to import, cultivate or exhibit in America were *Diervilla rosea* (1851), hardy kinds of *Azalea mollis* (1874), *Cissus discolor* (1854), "the harbinger of the infinite variety of ornamental-leaved plants now so generally cultivated and admired," *Clematis cærulea*, var. *grandiflora* (1841), *Lilium lancifolium*, var. *album*, the first of Japanese lilies, *Gladiolus floribundus* (1836), and *Oncidium flexuosum* (1837), a plant of which bore ninety-seven fully expanded flowers and was the first orchid reported at any American exhibition. The Marshall P. Wilder rose makes his name familiar to a later generation.

Wilder's greatest services to horticulture were intimately connected with the Massachusetts Horticultural Society and the American Pomological Society. Of the former he was a member for fifty-six years, and president from 1841 to 1848. He was one of the founders of the American Pomological Society, and with the exception of a single term was its president from its organization in 1848 until his death in 1886.

Wilder was an organizer. He is counted one of the founders of the Massachusetts Board of Agriculture and of the Massachusetts Agricultural College, and of the United States Agricultural Society (1852). He was president of the last from its foundation until 1857, and from 1868 until his death he was president of the New England Historic Genealogical Society. At twenty-six he was a colonel, and in 1857, after declining the nomination four times, he was elected commander of the Ancient and Honorable Artillery Company. He was a trustee of the Massachusetts Institute of Technology. At one time he was president of the state senate. In masonry he held all degrees, including the thirty-third. It is said that when Wilder was 27 there were no horticultural societies in America, and that he lived to see more than 1500 societies devoted to horticulture and kindred subjects.

In 1883 Marshall P. Wilder urged upon the American Pomological Society the necessity of a reform in the nomenclature of fruits. He took an active part in the great work that followed.

Wilder's personality was most engaging, being characterized by geniality, dignity, tact and conservatism. Horticulturists remember with what graciousness he met and recognized the younger men of merit at the meetings of the American Pomological Society. He was by nature a peacemaker, and in the early days when the conflicting interests of the Massachusetts Horticultural Society and the Mount Auburn Cemetery required separation, he was an important factor in solving the complicated and delicate problem. The settlement of this difficulty laid the foundations of the unparalleled wealth of the Massachusetts Horticultural Society. Wilder was a man of habit. Until he retired from business it was his life-long practice to rise early, devote the morning to books, garden and orchard, the middle of the day to business and the evening to family and study. He was married three times and had fourteen children, only five of whom survived him. He was sitting in his chair at home and engaged in conversation when death came to him instantly.

The portrait of him in Plate XLI was considered by Mr. Wilder to be his best likeness. At his death he left the American Pomological Society $1,000 for Wilder Medals for objects of special merit and $4,000 for general purposes. He left the Massachusetts Horticultural Society $1,000, to encourage the production of new American varieties of pears and grapes. Wilder wrote no book, but his occasional contributions and presidential addresses make a notable body of writings when gathered together into the bound volume presented by him to the library of the Massachusetts Horticultural Society. "The Proceedings at a Banquet given by his Friends to the Hon. Marshall Pinckney Wilder * * * to Commemorate the Completion of his Eighty-fifth Year," is a stately memorial of 116 pages published in 1883. The best account of him seems to be that by the secretary (Robert Manning) of the society, in Trans. Mass. Hort. Soc. 1887: 20-39, from which the present article has been chiefly compiled. W. M.

2723. A Wild Garden.

WILD GARDEN. Figs. 2723-28. Wild gardening is that form of floriculture which is concerned with planting in a nature-like manner colonies of hardy plants that require a minimum of care. A wild garden is not to be thought of as a garden run wild, nor should it be confused with the promiscuous sowing of flower seeds. "No form of gardening," says Wm. A. Stiles, "gives greater and more lasting pleasure than that which aims to naturalize wild or garden plants in positions where they will appear to be growing naturally and without the intervention of the gardener's art." A wild garden should be so planted and tended as to give "that appearance of untamed luxuriance, of careless and unstudied grace which suggests perfect freedom."

Both the idea and the name of wild gardening originated in the early seventies with William Robinson, of London, first editor of "The Garden" and author of many important books on floriculture. The idea came as a reaction against formal gardening in general and particularly the extravagant use of tender bedding plants to the exclusion of hardy herbs of less gaudy character and of simpler and less expensive cultivation. The idea spread rapidly in England and is steadily gaining in America. It appeals to the wealthy amateur with plenty of land and to all persons who delight in making nature-like pictures with the help of plants. It may also be in keeping in many small and humble areas. The plants in a wild garden require less care than those cultivated according to any other system. The main work is that of establishing the plants. If they are the right kind they will soon become colonies. All that remains to do is to remove brambles, thistles and other uncomfortable weeds and occasionally check the exuberance of the too vigorous species. On the other hand, wild gardening demands the highest intelligence and taste, close sympathy with nature, and that rare and precious quality—enjoyment of common and every-day things.

There is no finer feature of autumn landscape in America (so far as herbaceous growth is concerned) than the roadside asters and goldenrods. Yet when William Robinson conceived the idea of wild gardening, these lovely flowers were banished from the English hardy borders. In such an environment they waxed too strong and crowded out many slender-habited plants of delicate beauty. It seemed a pity to exclude these American plants from English estates. The important question was to find a proper environment for them. In the wild garden such plants require less care than in the hardy border, and they present nature-like effects, and are in place.

Asters and goldenrods are only two examples of the class of plants for which the wild garden was created. There are literally thousands of hardy plants from all over the world that will take care of themselves when once established in wild gardens. Many of these plants are unfit for intensive cultivation. They will never become general garden favorites. Some of them crowd out weaker-growing plants. Many of them have their "dramatic moment" and then lapse into the commonplace or unsightly. Others are too tall or rank or coarse or weedy for conspicuous and orderly positions. Again, many plants are insignificant as individuals but very effective in masses. There are hundreds of interesting plants that fail when measured by the conventional standards. Their foliage may be ill-smelling, sticky or prickly, but usually their flowers are too small or their season of bloom not long enough. The garden gate is locked against them all.

2724. Silphium perfoliatum.
Allied to the Compass Plant. Both are tall herbs, excellent for wild gardens.

2725. Sacaline naturalized in a wild garden.
This hardy herb grows 8 to 10 feet high in a single season.

Among our common native plants that revel in the wild garden are yarrow, Joe-Pye-weed, milkweed, rudbeckias, compass plants, sunflowers and a host of other perennial yellow-flowered composites, Bouncing Bet, bed-straw, evening primrose, St. John's-wort, lupines, button snakeroot, certain lilies, Oswego tea, orange hawkweed, asters, bugbane, goldenrods. All such plants tend to improve wonderfully when the struggle for existence is somewhat eased for them. Nor does this list exclude such treasures as the forget-me-nots, cardinal-flowers, blue flags, water lilies, pitcher plants and other marsh and aquatic subjects which properly belong to the moist or bog garden, though that is merely a department of the wild garden. Then there are the vines; and what wonders can be accomplished in a wild garden with wild grape, clematis, Virginia creeper, perennial pea, trumpet creeper and bitter-sweet! Think, too, of all the spring flowers and delicate woodsy things,—anemones, columbines, moss pink, Jack-in-the-pulpit, bloodroot, hepatica, Solomon's seal, dutchman's breeches, ferns, trilliums and violets! Evidently there is sufficient material for a wild garden composed exclusively of American plants, and naturally such material is least expensive. But the wild garden spirit is essentially cosmopolitan. Many of the exotics can be raised from seed, for it is not necessary that all the subjects be perennial. Some of the exotic mulleins, for example, are bold and striking plants; nearly all of them are biennial, but they resow themselves. Finally there is a vast number of rare plants that are dear to the heart of the collector, but their names mean nothing to the uninitiated. The native shrubs and trees may also have their places in the wild garden.

While the wild garden was created to make a place for plants outside the garden proper, it does not exclude the garden favorites. For example, an individual larkspur, foxglove or harebell in rich garden soil often grows so tall and slender as to require staking, and stakes are always objectionable. In the wild garden a lusty colony of any of these species may be self-supporting. All the leading border favorites can be used in the wild garden—peony, poppy, phlox, larkspur, iris, columbine and the rest. The tall-growing plants that are used in the back row of borders are nearly all suitable for wild gardens,—*Polygonum Sachalinense* (Fig. 2725), *Bocconia cordata*, *Cimicifuga racemosa*, Heracleum, Arundo (Fig. 2727), Rheum, hollyhocks, silphiums (Fig. 2724) and perennial sunflowers (Fig. 2726). There are only three tests which a candidate for the wild garden must pass,—hardiness, vigor and interest, for of course every cultivated plant should have something to make it worth while.

2726. Jerusalem Artichoke, one of the perennial sunflowers.

A nuisance in cultivated ground, but often useful in the wild garden.

To the many amateurs who wish to cultivate a few colonies of flowers in a small space, the naturalizing of free-growing hardy things is especially attractive. Give the wild flowers a bed by themselves. Avoid mixing cultivated and wild plants in the same border, for the hand of the stranger may "weed out" the wild things in favor of the others.

The place of the wild garden is somewhere near the borders, preferably well towards the rear of the place. However, there are degrees of wild gardening, and it is often in place against the rear buildings or even against the rear of the house. Figs. 2723, 2728.

Everyone who desires a wild garden should own a copy of that charming book "The Wild Garden," by Wm. Robinson. The latest edition, illustrated by Alfred Parsons, is the most desirable. The wild garden should not be confined to "wild" things, but may well include many exotics. In this way the wild garden becomes something more than an epitome of the local flora; and there is practically no limit to its interest and development.

W. M.

WILD ALLSPICE. See *Benzoin*. **W. Balsam-Apple** or **Wild Cucumber.** *Echinocystis lobata.* **W. Ginger.** *Asarum.* **W. Hyacinth,** in England *Scilla nutans;* in America, *Camassia Fraseri.* **W. Indigo.** *Baptisia tinctoria, Ipomœa pandurata.*

WILLOW. See *Salix.*

WILLOW, DESERT or **FLOWERING.** See *Chilopsis.*

WILLOW HERB. *Epilobium.*

WILLOW, VIRGINIAN. *Itea Virginica.*

WIND-BREAKS, in horticultural usage, are plantations of trees or other plants designed to check the force of the wind or to deflect it to other directions. Wind-breaks are often of the greatest use, and at other times they are detrimental. In regions of very strong prevailing winds, they may be necessary in order to prevent positive injury to the plants. This is true along seashores. In the dry interior regions, wind-breaks are often useful, also, to check the force of dry winds that would take the moisture from the land. In other cases, they are employed for the purpose of sheltering the homestead in order to make it more comfortable for human occupancy: such wind-breaks are usually known under the name of shelter-belts.

Whether wind-breaks shall be used for orchard plantations, depends wholly on circumstances. In regions of very strong prevailing winds, as near large bodies of water or on the plains, such breaks are usually necessary on the windward side of the orchard. However, if the prevailing winds are habitually warmer than the local temperature, the winds should not be stopped or wholly deflected, but they should be allowed to pass through the windbreak with diminished power in order that, while their force may be checked, they may still prevent too low temperature. In regions that are very liable to late spring and early fall frosts, a tight wind-break is usually a disadvantage, since it tends to confine the air—to make it still—and thereby to increase the danger of light frosts. If windbreaks are employed in such instances, it is best to have them somewhat open so that atmospheric drainage may not be checked. In most regions, the greatest value of the windbreak for orchard plantations is to protect from the mechanical injuries that result from high winds and to enable workmen to pursue their labors with greater ease. The lessening of windfall fruit is often sufficient reason for the establishment of a windbreak. Usually very cold and very dry winds should be turned from the orchard; very strong winds should be checked; temperate winds should nearly always be allowed to pass through the orchard, if their velocity is not too great; care must be taken to allow of adequate atmospheric drainage.

Wind-breaks for orchards require much land, and crops near them are likely to suffer for lack of food and moisture, and also from shade. In small places, therefore, it may be impossible to establish large wind-breaks. It is well to plant the wind-break at some distance from the last row of orchard trees, if possible. It is usually best to use native trees for the wind-break, since they are hardy and well adapted to the particular climate. Wind-breaks often harbor injurious insects and fungi, and care must be taken that species of trees liable to these difficulties be not used. In the northeastern states, for example, it would be bad practice to plant the wild cherry tree, since it is so much infested with the tent caterpillar. In some cases, very low wind-breaks may be as desirable as high ones. This is true in the open farming lands in the dry regions, since it may be necessary only to check the force of the wind near the surface of the ground. Wind-breaks only two or three feet high, placed at intervals, may have this effect. Fence-rows sometimes act as efficient wind-breaks. Along the sea-coast, gardeners often plant low hedges for the purpose of protecting the surface of the garden. Along the Atlantic coast, the California privet is considerably used. This is *Ligustrum ovalifolium*, a Japanese plant. In parts of California, one of the mallow tribe (*Lavatera assurgentiflora*, Fig. 2730) is used for this purpose. Farms in the open windy country may be efficiently protected by belts of woodland, or if the country is wholly cleared, rows of trees may be established at intervals of a quarter or half mile across the direction of the prevailing winds. Fig. 2729.

L. H. B.

Wind-breaks in Middle California.—The most common wind-break seen in middle California is composed of a tall thick hedge of Monterey Cypress (*Cupressus macrocarpa*), either clipped close or allowed to grow naturally; it withstands heavy winds better than almost any other heavy foliaged tree and is rapid in its growth. The Osage orange was at one time somewhat extensively planted as a wind-break, but is now rarely met with.

The Italians and Chinese, who have almost complete control of the truck-gardening industry in and around San Francisco, make extensive use of a Californian tree-mallow, *Lavatera assurgentiflora*, Fig. 2730—as a wind-break and protection from the drift-sand, which is such a prominent feature of the outskirts of the city. This plant is indigenous to some of the islands off the coast of southern California and, probably, was introduced into the San Francisco peninsula by the Mission Fathers, as the pioneers of 1851 and '52 report that it was then growing spontaneously and in great abundance on the sand dunes where the city now stands. This Lavatera proves to be well adapted to the peculiar conditions under which it is cultivated; it stands long seasons of

2727. The Giant Reed—Arundo Donax.
A tall plant of striking habit suitable for wild gardens and borders.

2728. A small wild garden at the rear of a building.

drought and heavy winds, bears close trimming, makes a rapid and dense growth, and continues in bloom almost throughout the year.

2729. Wind-breaks running across the direction of the prevailing winds.

When larger wind-breaks are required, to resist the force of heavy and steady winds sweeping over the interior plains through mountain passes, the manna gum, *Eucalyptus viminalis*, is used with advantage; this species suffers much less from strong wind than the more tender blue gum, *Eucalyptus Globulus*, which is used for the same purpose in the more equable climate of the Coast Range hills. Both the red gum, *Eucalyptus rostrata*, and the Lombardy poplar, *Populus nigra*, var. *Italica*, are used in the vineyard region near Fresno, to check the force of the periodic north-winds. *Arundo Donax* is also frequently grown around vineyards, particularly in the immediate vicinity of water. The olive, European walnut, fig and almond are frequently planted for the outside row of an orchard of deciduous fruit trees, to act as a partial wind-break.

Arundo Donax makes a charming shelter-hedge for a suburban garden, being light and graceful in appearance and not too exclusive, while answering all necessary purposes by providing a certain amount of privacy.

JOSEPH BURTT DAVY.

WINDFLOWER. *Anemone.*

2730. Lavatera assurgentiflora, a native plant much used for low wind-breaks in California.

WINDMILL FINGER GRASS. See *Chloris.*

WINDOW GARDENING. See *House Plants.*

WINEBERRY. *Rubus phœnicolasius.*

WINTER ACONITE. *Eranthis hyemalis.*

WINTER BERRY. *Ilex verticillata.*

WINTER CHERRY. *Physalis Alkekengi.*

WINTER CRESS. *Barbarea.*

WINTER GARDEN. In England, a very large glass structure suited for trees and plants that are not quite hardy and require only a small amount of artificial heat in winter. Winter gardens are especially adapted to strong-growing plants from Australia and the Cape, as acacias and araucarias. Himalayan rhododendrons, camellias and the hardier palms and tree ferns are also favorite subjects. The term "winter garden" is practically unknown in America. The word is sometimes used as synonymous with glass-house or conservatory.

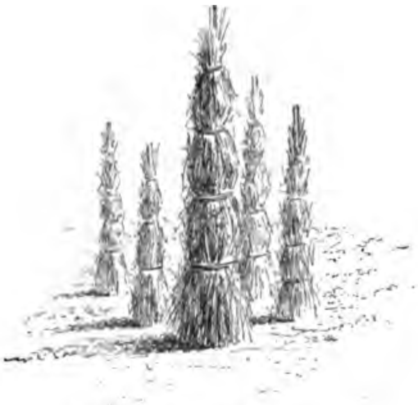
WINTERGREEN. *Gaultheria* and *Pyrola.*

WINTERGREEN, FLOWERING. *Polygala paucifolia.*

WINTER PROTECTION, or preparing plants to withstand the winter (Figs. 2731–2742). All plants are usually hardy in their own habitat, but many become tender when removed to a colder climate, requiring artificial protection. A permanent covering of snow furnishes ideal protection, but unfortunately our American winters are very changeable. Continued, steady cold is seldom injurious, but the alternate freezing and thawing towards spring are often fatal, the damage varying according as the situation is wet or dry and the soil light or heavy. For example, shallow-rooted plants, as *Lobelia cardinalis*, will often be thrown out of the ground in clayey soil. Such damage may be prevented by placing sods over the plants. Gaillardias will winter safely in light, well-drained soils with ordinary protection, but perish if wet and heavy. The remarks in this paper are meant to apply in the vicinity of Chicago.

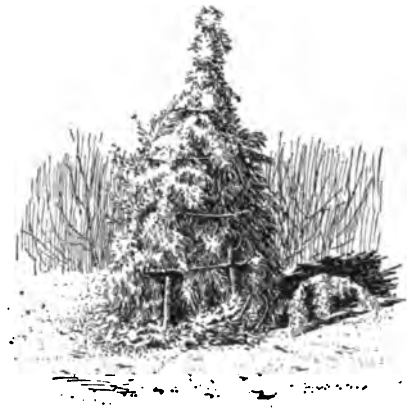
Winter covering intercepts the sun's rays and retards premature activity. It is as essential "to keep in the cold" during temporary warm spells as it is to retard excessive depth of frost. More damage is generally done in February and March than earlier. Roses and other shrubs may be prepared for the winter any time from the last half of November until well into December, but anything of an herbaceous nature may be covered much earlier. Where field mice are troublesome it is well to defer covering until after a good freeze, so that these nibblers may seek other winter quarters. Rabbits are fond of the Japan quince, *Spiræa Van Houttei*, *Euonymus alatus* and some others, and often damage newly planted material the first winter. When the branches are beyond their reach, protect the trunk with straw, tar paper or burlaps, which will also prevent sun-blistering. If the shrubs are in groups or low-branched, run wire netting around them. Fall-planted material should be better protected against frost than established plants of the same species. All the Japanese flowering forms of the plum, peach and cherry tribes should have their roots mulched four or more inches deep. The fatal damage in the winter of 1898–99 was at the roots, not overhead. Figs. 2731, 2732 show protection by means of straw and boughs; 2733–35, protection inside of boxes, barrels and wire netting.

Plants with evergreen foliage, like *Heuchera sanguinea*, are safer with a covering that will not mat down and rot the foliage or injure the crown. The danger is in open, wet seasons. Forest leaves are excellent for winter covering, provided they do not mat down. Oak leaves are good, but those of elm, maple and other trees that shed their foliage early are soft and mat too much. Leaves may be held in place by evergreen boughs, brush, or tops of bushy perennials like our native asters, or coarse strawy material. When leaves are used in barrels or boxes, the top of the package should be water-tight, and the leaves dry when put in. This precaution is not essential in all cases, but it is a safe rule to follow. Tar paper is comparatively cheap and comes handy in many phases of winter covering. Gather the leaves when they are dry, and store under shelter until wanted. Save vines like those of *Clematis paniculata* and pole limas; they are good for covering climbing roses that are almost hardy. These keep off the bright sun when the plants are in a semi-frozen condition, shield them from the drying winds, and retard premature starting of the flower-buds. *Forsythia suspensa* trained as a climber on a south wall is benefited by such covering, or by burlaps, as its sheltered position induces activity too early and its flowering buds become a victim to late frosts. Any rhizomatous iris, such as the German iris, should be planted where surface drainage is ample, and in the case of young plants, or those recently divided, not covered with heavy manure, or they are likely to decay in wet weather. Cover such plants with light material. Old established plants seldom need protection. *Pyrethrum roseum* requires similar conditions and treatment. All lilies except the hardiest, such as *L. tigrinum*, *elegans*, *Canadensis*, *superbum*, *Philadelphicum*, *speciosum*, *tenuifolium*, etc., are best covered by a mound of ashes—wood or coal—which retains an even temperature. The other lilies may be mulched with manure and *L. candidum* with leaves. Eremurus in all its species, and *Alströmeria aurantiaca*, require a deep box of leaves and the surrounding soil well mulched. An inverted V-shaped trough placed over such low edging plants as *Veronica circæoides* and *Thymus Serpyllum*, var. *montanus*, is beneficial. It is well to take up a few plants of *Monarda didyma*, the double perennial sunflower, and *Thymus Serpyllum*, and winter them in a coldframe, over which place an old wooden shutter or anything to shed rain, placing leaves or manure over those that remain.



2731. Straw overcoats for roses.

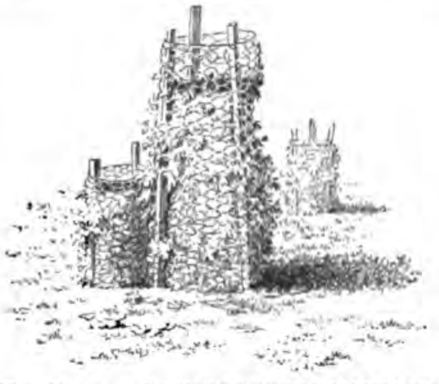
Where permanent wind-breaks, such as plantations of evergreens, buildings or solid fences, do not exist, temporary ones should be made of boards, evergreen boughs, corn-stalks, etc., to protect arboreal plants that are not quite hardy, e. g., in this climate *Halesia tetraptera*, and in the eastern states *Magnolia grandiflora*, hollies, etc. Place the wind-break at the sides towards the prevailing winds, generally north and west, and at the sunny side of any evergreen that browns. The boughs or stalks may be attached to wire netting or to cords fastened to stakes.



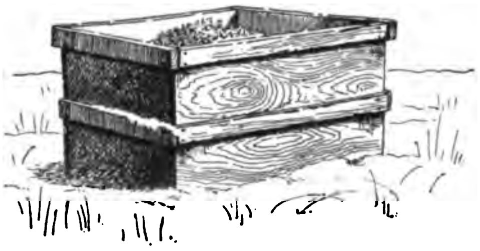
2732. A tender tree bound with branches of hemlock.
The protected tree is a specimen of Gordonia about 10 feet high, at Arnold Arboretum, Boston.

The so-called retinosporas may have placed over them an empty box open at the top. Shrubs that are still more tender should be boxed, the box having a tight top and ventilation at the sides. In all cases mulch well at the roots. *Magnolia Soulangeana*, *M. speciosa* and plants of similar degrees of hardiness may have their branches tied in and empty casks placed over them, one sitting partially inside the other, and held in place by stakes. Put a cone-shaped covering over the top to shed the snow. Or poles may be set close to the tree, wigwam fashion. Wrap these with burlaps, or wind string around them for the straw to lean against, and in both instances wrap with straw.

The so-called hardy climbing roses, such as the Seven Sisters and Prairie Queen, which are hardy without protection but are benefited by it, Wichuraiana and its hybrids, Paul Carmine Pillar, Russell Cottage, Crimson Rambler, Thalia, and Lord Penzance Sweetbrier hybrids, if against a wall, may have clematis or



2733. One way of protecting young rhododendrons.
The space inside the wire netting is filled with autumn leaves



2734. Protecting plants by covering with a box, inside which are placed leaves or straw.

other vines placed thickly over them; or if in an open exposed situation, they may be wrapped in straw. Fig. 2731. Better still, hill up the soil quite high at the roots, —to prevent breaking and to afford protection and drainage,—and extend the mound in the form of a gradually diminishing ridge. Bend the canes along the ridge, choosing a time when there is no frost in them, and cover with soil or sod. If the presence of a lawn prevents this method, lay on the grass and cover with a water-tight box filled with leaves. Canes will rot directly under an open knothole. In the spring allow them to remain prostrate some time after uncovering to inure them gradually to the change and to induce the lower buds to strengthen. Hybrid perpetuals, the tender forms of moss roses, Hermosa, Clothilde Soupert, and the dwarf polyanthas, may be wrapped, boxed or bent over and covered with soil. Those in beds may be bent over, the tops tied to the base of their neighbors, lead tags bearing numbers fastened to each plant, and a record taken of their names, and all summer labels stored to prevent loss when removing the leaves in the spring. Make a solid frame around them, higher at one end, and fill with leaves so as to cover the plants. Lap the roof boards; they will shed water and allow ventilation. In the spring remove the leaves, replace the top for a few days, but let the sides remain for a week or so to shield from cold winds. Keep the plants prostrate until cut back. The tenderer Teas are placed in coldframes or similar places. No manure is used until spring, as there is no moisture to wash it in. Tree peonies and yuccas should have an empty box placed over them, large enough to prevent the plant from touching the wood. *Hibiscus Syriacus*, diervillas, deutzias—except *D. Lemoinei* and *D. parviflora* which are hardy—*Itea Virginica*, *Cornus Mas*, etc., are wrapped in straw, and when the wrappings exceed four feet in height they should be staked to prevent high winds from toppling them over. Rhododendrons and *Azalea mollis* when planted out are taken up, the roots given a good soaking in a tub, and replanted in cold pits, or in boxes placed in a coldhouse or pits. In the spring, another bath is given them and the soil firmly pounded around them before replanting. This is essential for continued vigor. Cut all vines of the clematis to within one or two feet of the ground and lay them down, first mounding the soil a few inches if surface drainage is not good and cover with ashes, boxed leaves, or soil, or mulch well and wrap the canes with straw. If close to a porch or steps, do not let the swept snow stay over them, unless well protected, as this snow solidifies and excludes air. If, as some now think, the broken outer skin of the hybrid forms,—Jackmani, etc.,—subjects them to disease, then these varieties should not be bent over, but staked and wrapped. It is best not to cut the foliage of the eulalias or the Japan iris, as it, of itself, is a good protection, but manure at the base is essential. Cut down *Arundo Donax*, cover heavily with any material, and cover all with tar paper or water-tight shutters. Place half-rotted leaf-mold over fern beds, narcissi, English and Spanish iris or any early-blooming bulbous plant, or a light-strawy covering that is easily removed. Fine old manure a few inches thick is good and can remain. Place a good coating of stable manure around the trees on the lawn, and when they have been established any length of time bear in mind that the feeding roots extend out as far as the branches do. The soil under them has a double duty to perform—to sustain both the tree and the grass.

Place short stakes around groups of platycodons, *Asclepias tuberosa*, or any other plants that are late to appear in the spring. Otherwise they may be overlooked in the spring and injured by digging. Examine all labels and see that none are cutting into the limbs of trees. Replace all rotten or defaced ones in the borders, using heavy labels, as thin ones often break off and are carried away when the surplus manure is removed. Cypress is a good material for labels. A good label for young trees and shrubs is made of a thin sheet of copper. The name is written with a stylus. The label is fastened to a copper wire ring 3 or 4 inches in diameter, placed around the trunk and allowed to lie on the ground. Such a label is durable, unobtrusive and requires no attention for fear of cutting the wood, nor can it be lost.

W. C. Egan.

Pits, Cold Pits, Storage Pits and Plant Cellars (Figs. 2736–2742) are structures, with the greater part sunk beneath the surface of the ground, built for the purpose of protecting plants in winter without continued fire heat. They are employed almost exclusively for storing dormant plants. They are not suitable for storing growing plants any length of time, neither are they houses in which to grow plants. They should face the south and be sheltered against north winds by buildings or other wind-breaks. Owing to their position they should be put in well-drained ground only and well protected against surface water. A well-designed frame-yard is the best possible place for small pits

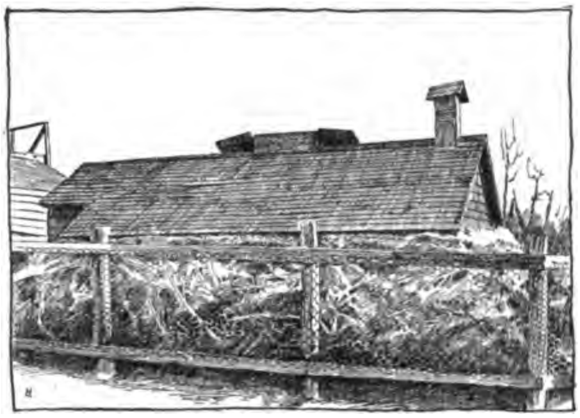
The coldframe (see *Frame*) used by market-gardeners for wintering cabbage and lettuce for spring planting, or by the florists for pansies, primroses, forget-me-nots, etc., is really a simple pit. Such shallow pits, with proper protection, are useful for many other small plants which would be injured by severe weather. A deep pit, like a coldframe, is shown in Fig. 2736. A pit built on the plan of the old-fashioned "outside cellar" (Fig. 2737) is very useful for storing tubers and roots. See that it is well ventilated. A section of another pit is shown in Fig. 2738. More elaborate pits, for accommodating large plants, are illustrated in Figs. 2739–42.

Forms of Pits.—Consult Fig. 2741, in which the entries are numbered for convenience Nos. 1, 2, 3 and 4. Nos. 1, 2 and 3 show inexpensive and convenient pits for small and medium-sized plants. They may be built 4 ft. or less below the level of the ground, the height and width as shown in the diagrams; the length should be some multiple of 3, anything between 9 and 30 ft., so that the glass roof may be made of hotbed sash and also protected by the straw mats and wooden shutters in common use. See *Hotbeds*.

2735. Plants protected in a barrel covered with burlaps.

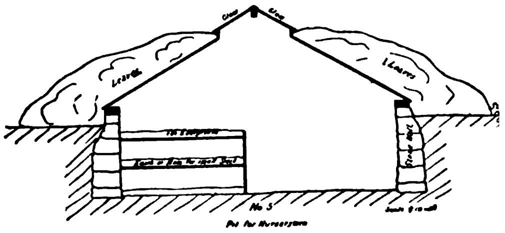
These pits are useful for storage in winter and also for carrying some of the hardier greenhouse plants in autumn until the houses are relieved of the chrysanthemum crop. Nos. 1 and 2 make light hotbeds in spring, if filled with the leaves which formed their winter protection, and are also available for growing such plants as euphorbia during the summer. They are generally too deep for dung hotbeds. Nos. 1 and 2 are planned to run east and west. If No. 3 is thus placed, the roof on the north side may be made of plank instead of glass, but if it runs north and south it should have a glass roof on both sides. Easy access to all is obtained through the roof by removing a sash. Sometimes a door can be built at one end of No. 3. No. 2 does not cost much more than No. 1 and furnishes more room. By putting a few doors in the board roof, excellent ventilation is provided. No. 3 gives the best head-room, but is rather dark for evergreens with soft foliage, e.g., *Cytisus Canariensis*, unless the whole roof is glass. A pit like this has always been used in the Arnold Arboretum for wintering seedlings, rooted cuttings and grafts,—young stock grown in flats but too delicate for the open ground. The arrangement of shelves shown in the diagram gives storage to large numbers of these small plants.

In No. 4 is shown a small plant cellar, more expensive but with better capacity for large plants. It should run north and south, and, excepting the glass roof, is wholly below ground, and consequently extremely well protected against frost. The door is at either end or side. By taking advantage of sloping ground it is possible to enter on the ground-floor level, which is important when large plants in tubs must be handled. In such cases a concrete floor may be built. The monitor roof provides plenty of light and ventilation; wooden shutters cover the glass in cold weather. This form of pit is not only well adapted to plants, but also is excellent for storing vegetables and fruits. The forms of buildings larger than those above described vary much with different circumstances. Sometimes the cellar of a stable, tool-house or other outbuilding can be utilized. The chief consideration is protection against frost, but provision must be made for thorough ventilation, and against a too high temperature in the autumn and early spring. It is because it is hardly possible to provide for these matters that dwelling-house cellars do not make good pits; they cannot be sufficiently ventilated to keep the temperature low enough except in the middle of winter. Growth is incited and cannot be maintained owing to lack of light.

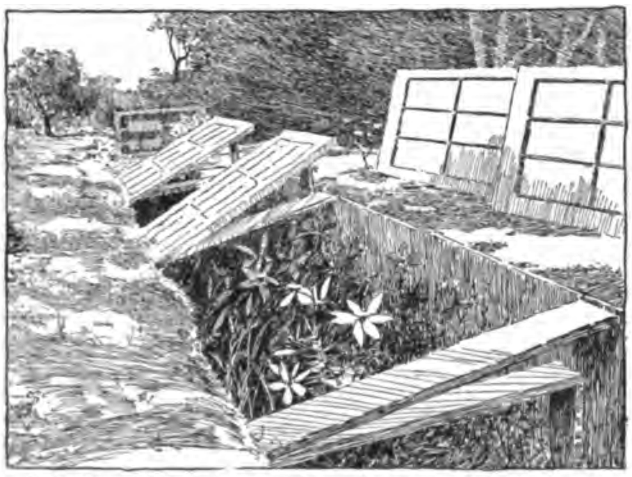


2737. An outside cellar, in which to store roots and tubers, and pots of resting stuff.

Construction of the Pits.—Owing to their position, pits cannot well be made of wood, plank and cedar posts lasting from 4–6 years only. For large pits, stone and brick are most economical for walls and ceilings; for small ones concrete probably makes the cheapest and best wall. At the Bussey Institution the concrete walls of several small pits have stood 10 or 12 years without showing sign of deterioration. It is not necessary to use hi priced Portland cements, because the structures are cured against frost by the winter protection required f their contents. An excavation of the required dime sions is made, with due allowance for the walls. Insi the excavation a plai molding frame is bu at the proper distanc viz., the thickness the walls, from tl walls of earth whi should have been c as true as possibl This frame, whic should also be true ai plumb, is carried to tl required height for tl inside face of wall ai another frame is mac at the proper distan on the surface of tl ground, the inner fa of which will be tl outside face of tl completed wall. Thes frames must be we braced; they carry heavy load until the c ment hardens. It i not necessary to mak a complete frame fc the whole pit at once one end and a half of both sides can be built first, and th same frame reversed will serve for the remainder. Th concrete is made by mixing dry one part of cement (good brand can be obtained at about $1.20 per barrel) t two parts of clean sharp sand. After thorough mixture, add enough water t make a thick paste. Add to this past three parts (sometimes four are used) o clean gravel. Broken stone is better bu more expensive. No stones larger than goose egg should be used. The whol should be completely and quite carefull blended with hoe or shovel until eac stone is coated. Throw this mass int the space between the molding frame an earth wall and settle compactly with rammer. It is not advisable to mix mor than a barrel at once, nor so much as thi unless at least six men are employed. Continuous batches are made until th work is finished. When the top layers ar going in, insert ¾-in. iron bolts 6–8 in. long at intervals of six ft. These secur the wooden sills. In warm dry weathe the frames can be removed within twenty-four hours or less, but first examine carefully the condition of the cement. After removal, smooth off any roughness and grout in with a whitewash brush a coat of Portland cement mixed with water, but without sand, thus obtaining a good color and a more homogeneous surface. For several days the work should be shaded



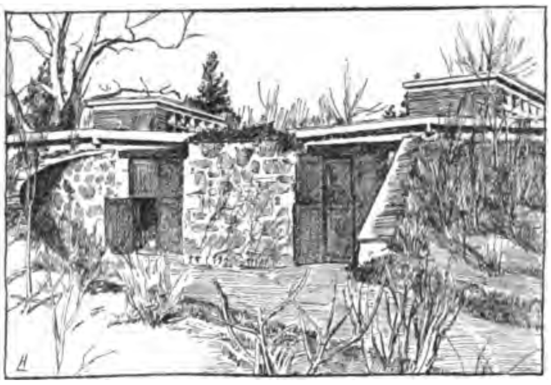
2738. Nurseryman's cold pit.
A cheap device for wintering plants that require comparativ little light.



2736. Deep pit built like a coldframe, for carrying half-hardy woody plants over winter.

and occasionally sprinkled with the hose. Do not attach the woodwork until the concrete is fully hardened. One and one-half barrels of cement make about one cubic yard of concrete, that costs, in place, between five and six dollars, somewhat less if the cost of labor, sand and gravel is moderate. Build in June or July, so that the concrete will be thoroughly dry before frost.

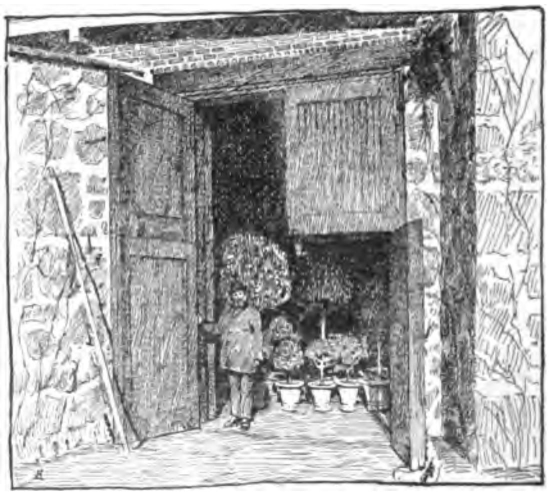
The construction of a brick roof is shown in Fig. 2741, No. 4. Concrete could also be used. A good grade hotbed sash makes the best glass roof. All sills, cross-bars, etc., should be made of cypress and painted. The woodwork must be made strong to endure the continual exposures. It is false economy to stint in quantity or quality. In cellars for nursery stock, Figs. 2737–41, a comparatively small amount of light is required, and the low roof is boarded in and shingled, building paper being used. Planks may be substituted for boards, or the roof may be double.


2739. A durable storing pit or cellar for very large plants.

Sand or gravel, one foot deep, makes the best floor, or half sand and half loam where plants are to be heeled-in. A concrete floor should be used only where the drainage is absolutely perfect.

The sides and ends should be banked with leaves or other material. See Fig. 2738. In the vicinity of Boston this should be done about November 15. The same covering can also be given to low roofs. The glass is protected by mats and shutters. See *Hotbeds*. It is a good plan to have on hand an extra supply of dry meadow hay to give additional shelter in zero weather.

Care and Management.—Pits, e.g. Nos. 1, 2 and 3, in Fig. 2741, like greenhouses, should carry more than one "crop." In early autumn they hold chrysanthemums, carnations, stevias, etc.; next the *Azalea Indica*, *Cytisus Canariensis*, heaths, etc., some of which remain for the winter, while others are replaced by hardy shrubs, bulbs and other plants for forcing. For spring and summer use, see above. In eastern Massachusetts gardeners begin to use them in September, but the final storage sometimes is not finished until Christmas. The longer the plants can be kept in the open air the better fitted they are for their winter quarters.


2740. A doorway in Fig. 2739.

In the care of pits, watering and ventilation are of prime importance. When first housed the plants should be well watered, and, if this is carefully done, it will often be found that no further water is required for plants in tubs and large pots (10 in. or more). This also is true of heeled-in stock. Everything, however, should be so arranged that inspection is easy, and water should be given when necessary. Plants on the shelves, particularly in small pots (4-inch), will go dry oftener than those placed on the gravel floor. It is best to water on bright days, when the sashes can be removed. The great difficulty in keeping plants in good condition is owing to the condensation of moisture within the pits at times when it is impossible to open them on account of severe weather; therefore no more water should be given than is absolutely needed. As long as the weather permits, keep the sashes off or the windows open night and day, and afterwards open up whenever possible. On sunny days ventilate whenever the thermometer registers over 20° F., but do not begin until the sun strikes the frames, and shut off early in the afternoon. On mild days, with the mercury above freezing, remove the sashes entirely. This is the best way to get rid of the moisture-laden air, and is essential for keeping evergreen plants with soft foliage in good condition. To change the air in large cellars is more troublesome; here it is advisable to build an open fireplace, in which a brisk fire may be kindled on mild days when all windows can be unclosed, thus obtaining a better circulation than is otherwise possible. Sometimes these large cellars have a line of hot-water pipes or other means of heating, by which not only is better ventilation secured but also additional protection in severe weather. Occasionally in heavy snows the pits must remain closed for a week or more. This is undesirable but unavoidable. At such times there is special danger from field mice and other vermin. Concrete walls give them a poor harbor, but they must also be trapped or poisoned. If the plants are clean when housed, there is nothing to be feared from ordinary greenhouse pests, either insect or fungous, except the moulds. For related discussions, see *Nursery* and *Storage*.

Following is a list of plants that may be wintered in pits and frames with satisfactory results. The list is made for the neighborhood of Boston.

LIST OF PLANTS THAT CAN BE WINTERED IN PITS.

A. *Hardy plants.*

1. Nursery stock of every description that may be required for shipment in winter and early spring.
2. Stocks, cions and cuttings for working during the winter.
3. Young nursery stock,—seedlings, cuttings or grafts too delicate for planting in autumn.
4. Hardy plants of all kinds for forcing or winter decoration.

The temperature of pit or cellar for the above plants should be 35° F. or even lower occasionally. The larger plants should be heeled-in on the floor in sandy loam or in bunk-like shelves along the sides. Instead of loam, sphagnum can be used and is particularly good for cuttings and grafting stock. The very young stock is stored in flats or pans in which it has been grown. Particular care must be given to ventilation when evergreen plants are handled. For forcing stock, see *Forcing*, pages 600–602.

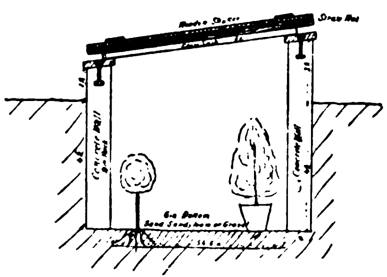
AA. *Tender and half-hardy-plants.*

Those marked with a star (*) are tender and should not be exposed to frost. They should also be kept in the driest part of the pit.

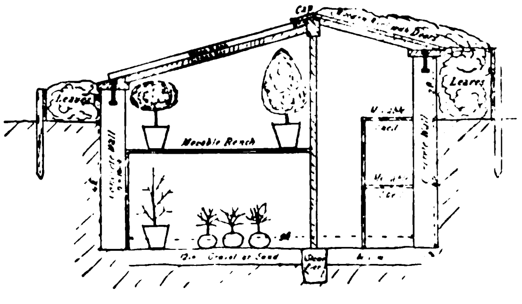
1. Alstrœmeria, canna, dahlia, gladiolus, *Milla biflora*, montbretia, oxalis for summer bedding, tuberose, tigridia, *Zephyranthes Atamasco*, *Z. candida*. Keep the above in dry house-cellars, where no frost penetrates, temperature 35–40° F. Dahlias and cannas can be covered with dry sand if prone to wilt. Tigridias should be hung up in bags to avoid mice.

2. Agave, aloe, *Lippia citriodora*, *Datura suaveolens*, some of the hardier cacti, e.g., *Cereus grandiflorus* and *Opuntia Ficus-Indica*, *Cordyline indivisa*, fuchsia, *Yucca gloriosa* and probably other genera and species of succulent plants. Keep at temperature 35–40° F. in a very dry house-cellar, with as much light as possible; too much moisture is destructive.

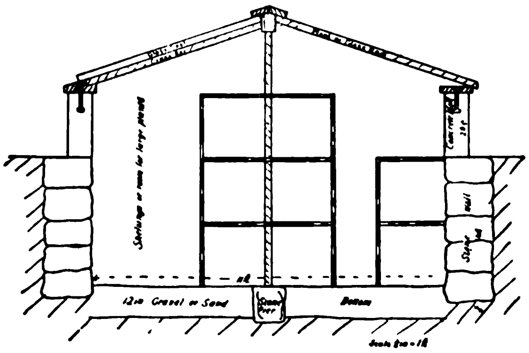
3. *Abelia rupestris*, *abutilon, *acacia, *Acanthus mollis*, **Agapanthus umbellatus*, *Araucaria imbricata* and *A. excelsa*, *Aucuba Japonica*, **Azalea Indica*, bamboos, *Buxus sempervirens*, **Callistemon lanceolatus*, *Calluna vulgaris*, *Camellia (different species, including the tea plant), *Ceanothus azureus*, *Cedrus Libani*, *C. Deodara*, *Cephalotaxus drupacea*, **Chimonanthus fragrans*, *citrus in variety, cistus (different species), cotoneaster (tender sorts), *Cryptomeria Japonica*, cupressus (tender sorts), **Cytisus Canariensis* and **C. racemosus*, **Daphne odora*, diospyros in variety, *erica (hardier sorts), *Erythrina Crista-galli*, **Eugenia Jambos*, *Euonymus Japonica* (tender varieties), *Farfugium* (Senecio) *grande*, *Ficus Carica*, **Gardenia florida*, *Gelsemium sempervirens*, *Gordonia pubescens*, grapes (tender kinds), *Hedera Helix*, **Hibiscus Rosa-Sinensis*, *Hydrangea hortensis*, *Ilex Aquifolium*, kniphofia, laurestinus, *Laurus nobilis*, lagerstrœmia, *Magnolia grandiflora*, *Myrtus communis*, **Nerium Oleander*, *Olea Europæa*, **Osmanthus fragrans*, *O. Aquifolium*, *Passiflora cærulea*, pernettya (different species), *Phormium tenax*, *Photinia Japonica*, **Pittosporum Tobira* and others, *Plumbago Capensis*, *Podocarpus Chinensis*, *Prunus Lauro-cerasus* and others, **Psidium Guajava*, **Punica Granatum*, retinospora in variety, rhododendron (tender hybrids), *Romneya Coulteri*, roses (Bourbon, Noisette, China, Bengal and other tender varieties), *Rosmarinus officinalis*, *Sequoia gigantea*, Taxus, *Trachelospermum jasminoides*, *Ulex Europæus*.



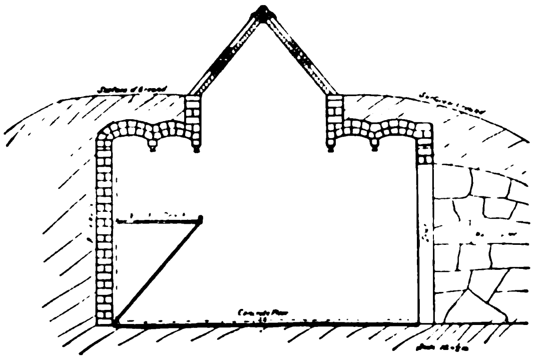
No. 1.—One of the simplest and least expensive forms of cold pit for small and medium-sized plants.



No. 2.—A well-ventilated cold pit, roomier than the preceding one and not much more expensive.



No. 3.—A shelved cold pit for wintering young stock grown in flats, seedlings, rooted cuttings and grafts.



No. 4.—A small plant cellar for wintering large plants. It is also excellent for storing vegetables and fruits. It combines perfect ventilation with extremely good protection against frost.

2741. Various forms of storage pits.

The above plants are commonly handled in pits for various reasons. In eastern Massachusetts, with the possible exception of those marked thus (*), they will bear a few degrees of frost, if not too long continued, without harm. The average temperature of the pit should be just above freezing, say 35° F. The value of these plants depends upon not only carrying them through the winter in good condition, but also in giving them a good start in the spring. For this purpose a cool greenhouse must be provided; a cold grapery or a house constructed from the sashes used on the pits is equally good, in which the plants can be properly grown until it is warm enough to put them out-of-doors.

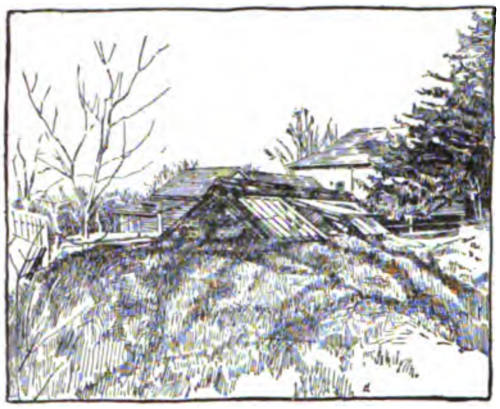
4. *Anemone Japonica* and *A. coronaria*, *Bellis perennis*, *Dianthus Caryophyllus* (clove pinks and European carnations from seeds), *Galax aphylla*, myosotis sorts, primula in variety, including auricula, Persian ranunculus, *Viola odorata* (tender sorts), pansies, wall-flowers, lettuce, cabbage, cauliflower and parsley. These plants are advantageously wintered in coldframes, which should vary in depth with the size of the plant; sometimes the plants are grown and flowered in the frame, at others they are bedded out when the season permits.

5. Arisæma, arum, calochortus (different species), freesia in variety, iris (tender species), ixia, sparaxis. The above plants can be potted, November to December, and carried in a pit until wanted in the greenhouse.

B. M. Watson.

WISCONSIN, HORTICULTURE IN. Fig. 2743. The surface of Wisconsin mostly varies between gently rolling plains and hills of moderate height. Small lakes are numerous, particularly in the north. The soil presents all variations, and with the exception of some rather large sandy and marshy tracts, is mostly very fertile. Owing to the proximity of Lakes Superior and Michigan, the climatic extremes are less severe than might be expected in a region so remote from the ocean. The skies, while clearer than in the eastern states, are somewhat more cloudy than in Iowa and Minnesota.

Damaging frosts are not common in Wisconsin except in certain districts of comparatively small extent. As in all of the northwestern states, summer droughts are rather frequent, but are rarely so severe as to seriously injure crops that are properly cared for. The numerous lakes and streams offer excellent opportunities for irrigation, which has, however, received little attention as yet. The prevailing winds are westerly, hence the influence of the Great Lakes in tempering the climate is less marked than in the southern peninsula of Michigan, but the climate of the eastern counties, and especially that of Door county, which lies between Green Bay and Lake Michigan, is comparatively mild.



2742. The roof of No. 4, Fig. 2741.
(See *Winter Protection*, pages 1981-5.)

The winters of Wisconsin are such as to preclude the extensive cultivation of the tree fruits, except of the hardier species and varieties, save in the eastern counties. But the summers are very favorable to annual crops, and to fruits that are readily protected in winter. The change from winter to summer is often rather abrupt. This brings on an exuberant growth early in the season, which while satisfactory for most crops, promotes blight in the pome fruits. An equally precipitous advent of winter sometimes causes damage to nursery stock. These sudden changes, with the rather frequent droughts in summer, combine to render the Wisconsin climate severe for most perennial plants. When an exceptionally dry summer is followed by a winter of unusual severity, a disastrous thinning out of fruit trees is likely to occur. The pioneer fruit planters, coming mainly from New York and New England, with pardonable ignorance of the severity of the Wisconsin climate, planted freely of eastern varieties, most of which proved too tender for the new conditions. As the natural result, the first orchards were mainly short-lived, and the idea gained wide credence that Wisconsin would never produce the tree fruits successfully. But the experience of a few persistent planters has disproved, in a measure, this hasty conclusion.

Wisconsin is one of the newer states in horticultural development. A large part of its northern half is still forest-clad. The cities are mostly small, hence the local demands for horticultural products are not large. But Minneapolis and St. Paul to the west, and the cities bordering Lake Superior, make an export demand for fruits and vegetables, for which the markets are generally good.

The hardiest varieties of the apple succeed in southern and eastern Wisconsin, when planted on sites somewhat higher than the surrounding country, especially those inclining to the north or northeast. The principal orchards are located in Fond du Lac, Green Lake, Richland, Sauk, Door and Waupaca counties. The first named county has one orchard of about 6,000 trees, mostly Oldenburgh, located near Ripon, and a second of about 4,000 trees of various sorts at Eureka. These orchards are supposed to be the largest in the state.

The older orchards of Wisconsin are the outcome of a long process of climatic selection. But the farmers who were most anxious to grow apples continued to plant trees in the hope of finding some that would prove satisfactory, and these hopes have been in part realized. Occasional seedling trees that grew up in fence corners and elsewhere, from chance seeds, or from seeds planted by pioneer farmers who felt unable to purchase trees, were found to endure the severer winters, while whole orchards of old varieties were destroyed. Several of these have been adopted into cultivation, and a few, as the Pewaukee, Wolf River, McMahon, Northwestern Greening and Newell, have become standard varieties of the northwest. The Wealthy apple, from Minnesota, is also a standard winter sort in Wisconsin. The orchards now being planted are largely of these sorts, and the Oldenburgh. The Russian apples imported by the United States Department of Agriculture and the Iowa Agricultural College have been quite largely planted experimentally in Wisconsin, but thus far very few if any of them have proved superior in any respect to our best natives. Crab apples are considerably grown for market in Waupaca and Eau Claire counties. The chief hindrances to apple culture in Wisconsin, aside from winter-killing, are the fire-blight, which destroys the tips of the growing shoots in early summer, and sunscald, which causes damage to the trunk in early spring or during hot weather in summer. The latter is readily prevented by shading the trunk. The codlin-moth is destructive unless prevented by spraying or otherwise. The apple scab is often serious in too closely-planted orchards. It is controlled to a degree by spraying. The apples of Wisconsin are, as a rule, highly colored and of large size, and the trees are very productive.

The pear is not grown to any great extent in Wisconsin, owing to the liability of the trees to fire-blight and winter-killing. The varieties imported from Russia have not proved more resistant to these affections than the hardier sorts of American origin, or from western Europe. Pears are frequently grown for home use in the eastern counties, and the trees are sometimes quite productive and long-lived. The Flemish Beauty has perhaps been more successful than any other sort.

The quince is less hardy in Wisconsin than the pear. Trees are occasionally found in gardens in the eastern counties that sometimes bear fruit after exceptionally mild winters.

The Americanas are the only plums that can be depended upon to bear fruit regularly in all parts of Wisconsin. The hardier sorts of the European plum, *Prunus domestica*, and of the Japanese plum, *Prunus triflora*, are fairly fruitful in the eastern part, notably in Door and Kewaunee counties. The trees of the last two species, as of those of *Prunus hortulana* and *Prunus angustifolia*, endure the winters without harm throughout the state, but the flower-buds are destroyed whenever the thermometer registers much lower than 20° below zero. Few plum orchards have been planted in Wisconsin, and these are mainly of the European class. A plum orchard of 14 acres at Sturgeon Bay is supposed to be the largest in the state.

The early Richmond and Morello cherries are fairly successful in Wisconsin, in localities suitable to the apple. The flower-buds of these cherries appear to be somewhat more hardy than those of the European and Japanese plums. The trees are, however, subject to sunscald, and unless protected are usually short-lived. Several varieties of *Prunus Cerasus*, introduced from Russia, have been tested at various points in the state. While the flower-buds of these do not appear to be hardier than those of the above-named sorts, their fruit matures over a longer period, which will give them value. Sweet cherries (*Prunus Avium*) are not successful in Wisconsin.

The peach and apricot are not fruitful in any part of Wisconsin except after unusually mild winters. The trees are frequently grown in gardens, and sometimes attain considerable size, but they freeze back more or less in the average winter. Trees of the apricot imported from Russia have been frequently planted in Wisconsin, by way of experiment, but are nowhere fruitful. Even if the flower-buds escape destruction, the fruit almost invariably falls soon after setting.

The grape, with winter protection, is successfully grown throughout southern and eastern Wisconsin when planted on light soil, with southern exposure. The later varieties are, however, liable to be caught by frost, unless the site is chosen with special care.

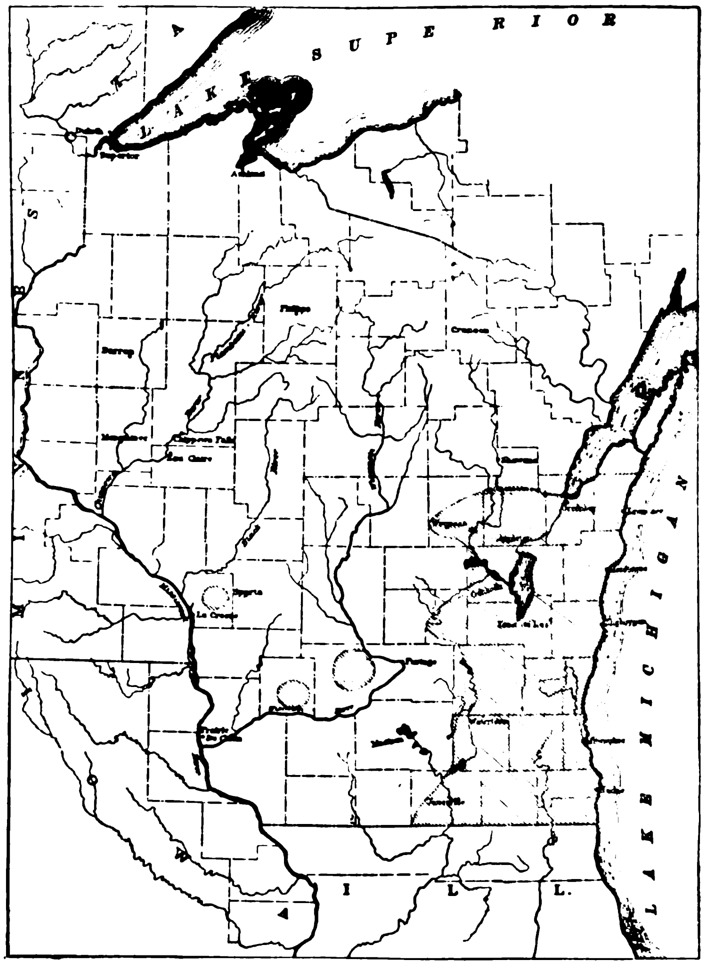
The small fruits are grown with marked success, on favorable soils, throughout Wisconsin. Winter protection is generally given to all but the currant and gooseberry, but in the southern and eastern counties this precaution is not absolutely necessary. The strawberry and raspberry are grown in excess of home demands, and many thousand cases of these fruits are annually shipped to other states. Blackberries were largely destroyed by the severe freeze of 1899. Huckleberries and blueberries are extensively gathered from wild plants in certain parts of west-central Wisconsin, and are shipped in large quantities to cities of the northwest. Wisconsin is one of the chief cranberry producing states. In parts of Wood, Adams and Juneau counties, and in less degree in Waupaca and Green counties, the cranberry plant was native over very large areas, and before the settlement of the country, the Indians gathered the fruit extensively in bearing years. Latterly, the wild marshes have been largely improved by clearing and providing flooding facilities. In some seasons the total output of cranberries from Wisconsin has aggregated nearly 100,000 barrels. The varieties grown are mostly native, and the quality and keeping of the fruit are excellent. During the years 1894 and 1895 the cranberry industry of Wisconsin suffered a serious check by the destruction of many marshes by fire during an exceptionally dry period. But the business is rallying, and may, in a few years, recover its former magnitude.

Market-gardening is carried on in the neighborhood of cities and towns to a sufficient extent to supply local demands, except in the extreme northern part of the state. The ordinary garden crops of the temperate zone are all successful. Melons are grown rather extensively for shipment in a few localities. Peas are extensively grown for seed, for market and for canning in Kewaunee and Door counties, this section being free from the pea weevil. Lentils are considerably grown in Kewaunee and Manitowoc counties. Several vegetable canning factories are in operation in Wisconsin, peas, sweet corn and tomatoes being chiefly consumed. Kitchen-gardening is less practiced in Wisconsin than it should be. The farmers generally employ little hand labor, and the hot summers render city gardening more or less unsatisfactory. For the same reason the private growing of flowers receives less attention than in the eastern states.

Horticulture is taught at the agricultural college connected with the University of Wisconsin, at Madison.

Openings are good for commercial culture of apples, cherries, native plums and cranberries in the parts of Wisconsin best suited to these crops, and in the neighborhood of northern cities the growing of vegetables for market is at present remunerative.

E. S. Goff.



2743. Map of Wisconsin.

The shaded areas include most of the region adapted to apple culture. Cherries do fairly well in the apple districts.

WISTÀRIA (Caspar Wistar, 1761–1818, professor of anatomy in Univ. of Pa.). *Leguminòsæ*. As a genus Wistaria is a small and imperfectly understood group. A complete study of the pods and seeds of this and allied genera will eventually result in a great shaking up of names. The present treatment is as conservative as possible, out of deference to trade interests. The oldest generic name is *Kraunhia*. For a more radical point of view see B.M. 7522 and B.B. 2:294. Beside those mentioned below, there are three species, but they are all of doubtful botanical status. Lvs. odd-pinnate; lfts. entire: racemes terminal: calyx with the 2 upper teeth short and subconnate: standard large; wings oblong-falcate, free from the keel, often coherent at the apex: keel incurved, obtuse.

Wistaria Chinensis is one of the best and commonest of hardy climbers. It has pale green, pinnate foliage and bears profusely dense, drooping clusters of purplish pea-shaped flowers. The clusters are about a foot long. This is the commonest and best form. The others furnish the connoisseur with variety in habit, color and season of bloom, but they are not as prolific, and doubling adds nothing to the beauty of the flowers. Moreover, the double flowers decay quickly in wet weather. The Chinese Wistaria was introduced into England about 1816. Twenty-five years later there was a specimen in England with branches attaining 100 ft. on each side of the main stem, and another specimen that covered 905 square feet of wall space.

The Chinese Wistaria blooms in May and usually gives a smaller crop of flowers in August or September. The spring crop is borne on spurs, while the autumn crop is borne on terminal shoots of the season. There are several ideas about training a Wistaria. A good way is to let it alone. This produces rugged, twisted and picturesque branches and gives a certain oriental effect, but it is not the best method for covering a wall space solidly or for making the best display of bloom. To cover a wall completely it is necessary to keep the leaders taut and to train outside branches wherever they are needed. If quantity of bloom is the first consideration the vines should be pruned back every year to spurs, a common method in Japan. The Japanese chiefly use another species, *W. multijuga*, which often passes in our nurseries under the name of *W. Sinensis*, the clusters of the Japanese favorite sometimes attaining 3 or 4 feet. The low, one-storied Japanese building will have a Wistaria so trained that the vine follows the eaves all round the house. The foliage is all above, and the yard-long clusters of purple blossoms depend therefrom in solid, unbroken, linear masses, 2 or 3 ranks deep. *W. multijuga* is said to be less vigorous and productive in America and Europe than Japan. When trained as a standard the Wistaria requires much care. Probably the finest standard Wistaria is that figured in G.F. 6:256 and Gng. 1:321, where full directions for cultivation may be found. The following dates of bloom will be useful to those who reckon from the latitude of New York: *W. Chinensis*, May 10–30; *W. multijuga*, May 15–31; *W. speciosa*, June 1–8.

2744. Wistaria Chinensis.

Wistarias will live in rather dry and sandy soil, but they prefer a deep and rich earth. Cuttings root with difficulty and the common nursery practice is to graft a small shoot on a piece of root. The roots are long and few and go down deep, making few fibers. They resemble licorice root. Wistarias are hard to transplant, unless they have been pot-grown for the purpose or frequently transplanted in the nursery row. Unless manured heavily when transplanted, they are very slow in starting into vigorous growth. The most satisfactory method of propagation for the amateur is layering. Those who wish to give a young Wistaria an extra good start may sink a bottomless tub in the ground and fill it with good soil. If a Wistaria is to be trained to a tree, select an old tree, if possible, which is past the height of its vigor.

INDEX.

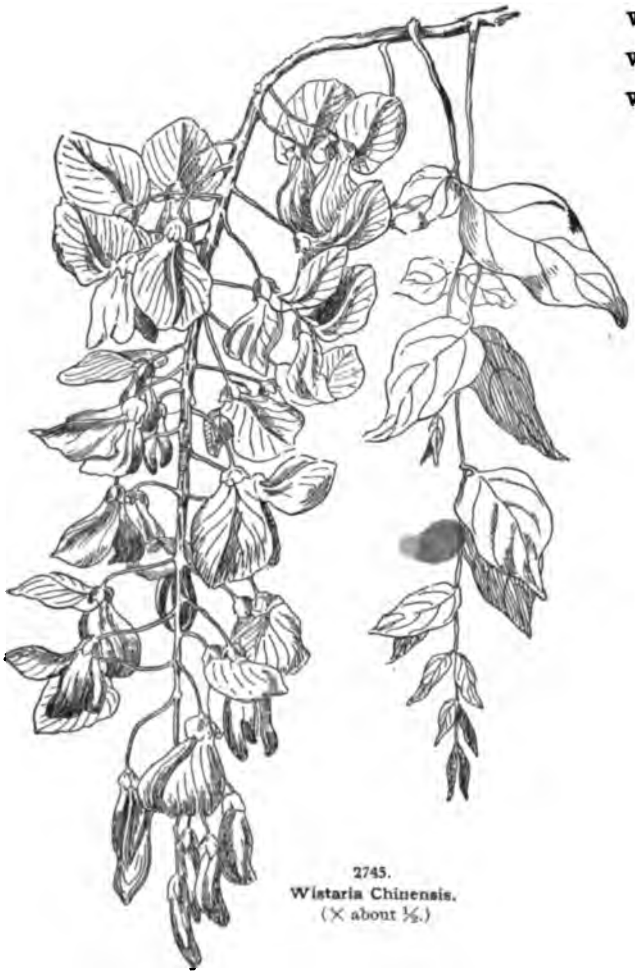
alba, 1, 2, 3, 4.
albiflora, 1.
brachybotrys, 4.
Chinensis, 1.
consequana, 1.
flore-pleno, 1.
frutescens, 3.
macrobotrys, 1.
magnifica, 3.
multijuga, 2.
rubra, 4.
Sinensis, 1.
speciosa, 3.
variegata, 1.

A. *Clusters moderately long and dense, 7–12 in. long, 25–50-fld.: fls. odorless*..........1. **Chinensis**
AA. *Clusters 2–3 ft. long and looser: fls. odorless*..2. **multijuga**
AAA. *Clusters short, 2–8 in., 12–25-fld.: fls. fragrant.*
B. *Lfts. glabrous above*.3. **speciosa**
BB. *Lfts. silky* ....4. **brachybotrys**

1. **Chinénsis**, DC. (*W. Sinénsis*, Sweet. *W. consequàna*, Loud. *W. polystàchya*, C. Koch.). CHINESE WISTARIA. Figs. 2744, 2745. Hardy, fast and tall growing climber with pale green compound foliage and foot-long clusters of purplish pea-shaped fls. borne profusely in May. Lfts. about 11, ovate-lanceolate, 2–3 in. long, silky: racemes 7–12 in. long, about 25–50-fld.: fls. odorless, ¾ in. long, 1¼ in. across: fr. borne very sparingly, especially on the var. *albiflora*. May and Aug. China. Clusters in B.M. 2083 (adapted in Fig. 2745), L.B.C. 8:773, P.M. 7:127 and B.R. 8:650 (as *Glycine Sinensis*), and Gn. 39, p. 409. Habit in Gn. 4, p. 173; 11, p. 380; 12, p 469; 34, p. 376; 44, p. 7; 48, p. 157; 49, p. 43; 50, p. 183; 51, p. 396; 52, p. 310; 53, p. 471; G.C. III. 21:7 and Gn. 51. p. 286, the last showing the spur system of pruning. V. 14:162 (pot-plant). G. F. 6:256 and Gng. 1:321 show "standards." The typical form has single purple fls. and is sometimes called var. *purpurea*, Hort. Var. **albiflòra**, Lemaire (var. *álba*, Hort.), has single white flowers. I.H. 5:166. Gn. 53, pp. 325, 470. Var. **alba plèna**, Hort., has double white flowers. Var. **flore-plèno**, Hort., has double purple flowers. F. 1882:33. Gn. 17, p. 105; 34, p. 373. Var. **macrobòtrys**, Beau. (*W. macrobòtrys*, Hort.), has fls. of a paler shade of blue-purple, the clusters longer and looser, not adv. in America. Var. **variegàta**, Hort., has variegated foliage and is inferior to the common form in habit and productiveness. Undesirable except for foliage effects.

2. **multijùga**, Van Houtte (*W. Chinénsis*, var. *multijùga*, Hook.). LOOSE-CLUSTERED WISTARIA. Fig. 2746. Distinguished from *W. Chinensis* by the longer and looser raceme and smaller fls. which appear a week later. Lfts. 17–21, silky when young, nearly glabrous when old, pale green, larger than *W. Chinensis*: racemes 2–3 ft. long, twice as long as in *W. Chinensis*, looser and sometimes 100-fld.: fls. about half as large as in *W. Chinensis*: pods oblanceolate, flattened, with rigid, flat, thinly woody valves: seeds orbicular. Long supposed to be native to Japan, but probably native to north China. F.S. 19:2002. R.H. 1891, pp. 176, 177. B.M. 7522. Gng. 2:161. G.C. III. 13:233 and S.H.

2:463 (both erroneously as *W. Chinensis*). M.D.G. 1898:477. Botanically this is a variety of *W. Chinensis*, but for horticultural purposes its distinctness needs emphasis. It is often cult. under the name of *W. Chinensis*. Var. **álba,** Hort., is also cult.


2745. Wistaria Chinensis. (× about ½.)

3. **speciòsa,** Nutt. (*W. frutéscens*, Poir.). AMERICAN WISTARIA. KIDNEY BEAN TREE. Not as vigorous as the Chinese Wistaria but climbing over trees and bushes to a length of 30–40 ft., with dark green foliage and short racemes of lilac-purple fls. borne about 3 weeks after *W. Chinensis*. Lfts. 9–15, glabrous and dark green above, pale and sometimes slightly pubescent beneath: racemes 2–7 in. long, about 14-fld.: fls. ½–¾ in. long: pods long, torulose, hardly coriaceous, with convex valves; seeds reniform, freely produced. June. Low grounds, Va. to Kans., south Fla. to La. B.M. 2103 (as *Glycine frutescens*). B.B. 2:294.—Var. **álba,** Hort., has white flowers. Var. **magnifica,** Hort. (*W. magnífica*, Hort.), has racemes 6–8 in. long and 50–60-fld., with fls. 1 in. across. The fls. are lilac with a yellow spot, and borne earlier than the type. The clusters are larger and denser. A great improvement. F.S. 11:1151.

4. **brachybòtrys,** Sieb. & Zucc. SHORT-CLUSTERED WISTARIA. Japanese species, distinguished from all others by its low growth. It is said to attain only 3–5 ft. and should therefore be particularly desirable for standards and bushy specimens. Lfts. 9–13, silky: racemes about 6 in. long, about 25-fld.: fls. purple, 1 in. across: pods tomentose. Late bloomer. Japan. S.Z. 1:45. F.S. 9:880.—Vars. **álba** and **rùbra,** are offered.

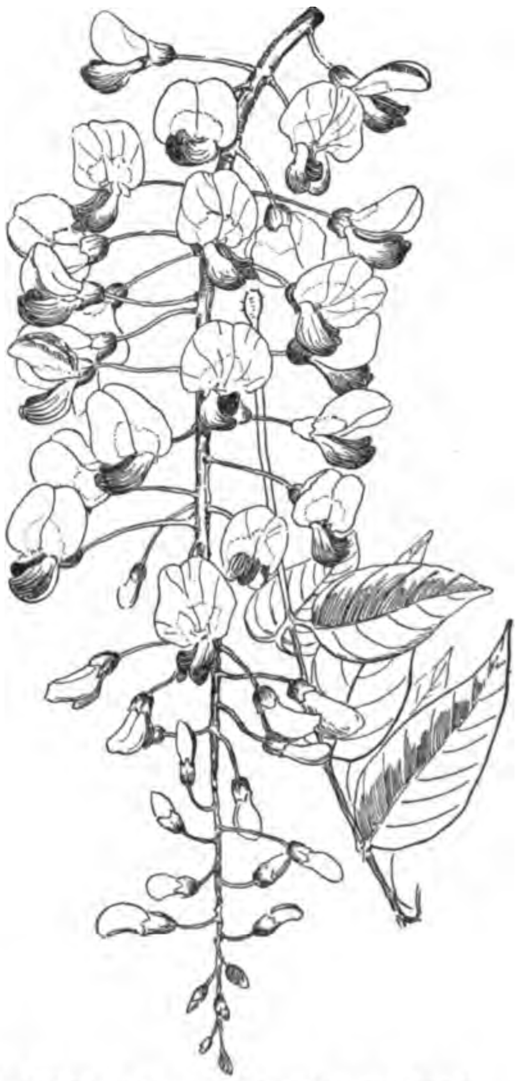
W. álba has been used in trade catalogues for W. speciosa, var. alba. *W. Japónica*, Sieb. & Zucc. See Millettia.—*W. nívea*, Hort. John Saul, was doubtless a white-fld. variety of some common species.

W. M.

WITCH ELM. *Ulmus scabra.*

WITCH HAZEL. *Hamamelis.*

WITHÀNIA. Consult *Salpichroa.*


2746. Wistaria multijuga, often called Japanese Wistaria. (× ¾.)

WITLOOF. A form of Chicory (which see).

WOAD. See *Isatris.*

WOLFBERRY. *Symphoricarpos occidentalis.*

WOLFSBANE. See *Aconitum.*

WONGA WONGA VINE. *Tecoma australis.*

2747. Woodsia Ilvensis (× ⅛).

WOOD BETONY. *Stachys Betonica.*

WOODBINE. In England, *Lonicera Periclymenum;* in America, *Ampelopsis quinquefolia.* .

WOODRUFF. See *Asperula.*

WOOD LILY. *Trillium.*

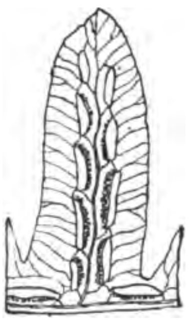
WOÒDSIA (Joseph Woods, an English botanist). *Polypodiàceæ.* A genus of mainly rock-loving ferns characterized by their inferior indusium, which is attached beneath the sorus, inclosing it at first but soon splitting into star-like lobes, and later hidden beneath the sorus. Some fifteen species are known, of which seven grow wild in this country. The following native species are sometimes cultivated in borders. Treatment given other hardy ferns will suit them well. Both grow best amongst rocks.

2749. Pods known as "Worms" and "Caterpillars," sometimes grown for curiosity.

Ilvénsis, R.Br. Fig. 2747. Lvs. growing in rosettes or tufts, 3–8 in. long, 1 in. or more wide, bipinnatifid; segments crowded, obscurely crenate: sori confluent when old. Eu. and N. Amer. north of Va.

obtùsa, Torrey. Lvs. clustered, 6–15 in. long, 2–4 in. wide, minutely glandular-hairy, bipinnate; pinnæ rather remote, triangular-ovate. New England to Arizona.

L. M. UNDERWOOD.



2748. Fruiting lobe of Woodwardia Virginica (× 1½).

WOOD SORREL. *Oxalis Acetosella.*

WOODWÁRDIA (Thomas J. Woodward, an English botanist). *Polypodiàceæ.* A genus of rather coarse-foliaged ferns of diverse habit and structure, but all bearing the sori in rows arranged parallel to the midrib like links of sausages. Commonly known as the CHAIN FERN. See *Fern.*

A. *Lvs. of two sorts, the veins everywhere forming areolæ.*

areolàta, Moore (*W. angustifòlia*, Sm.). Sterile lvs. deltoid-ovate, with numerous oblong-lanceolate sinuate pinnæ; sporophylls with narrowly linear pinnæ 3–4 in. long. Mich. to Fla., mostly near the coast.

AA. *Lvs. uniform.*

B. *Veins forming one or more series of areolæ.*

radicans, Sm. Lvs. rising from a caudex 3–5 ft. long, gracefully curved; pinnæ 8–15 in. long, 2–4 in. wide, pinnatifid nearly to the midrib. The true *W. radicans* from Europe bears scaly buds toward the apex of the leaf and roots to form new plants. The Californian and Mexican species, which has often been referred to this species, is really distinct and never roots.

orientàlis, Swz. Lvs. 4–8 ft. long, 12–18 in. wide, with lanceolate pinnæ and sinuate pinnules; veins uniting freely. Japan and Formosa.

BB. *Veins free between the sori and the margin.*

Virgínica, Smith. Fig. 2748. Lvs. 12–18 in. long, 6–9 in. wide on stout stipes; pinnæ linear-lanceolate, 4–6 in. long, cut nearly to the rachis into oblong lobes. Can. to Mich., Ark. and Fla.

L. M. UNDERWOOD.

WOOLLY BUTT. *Eucalyptus longifolia.*

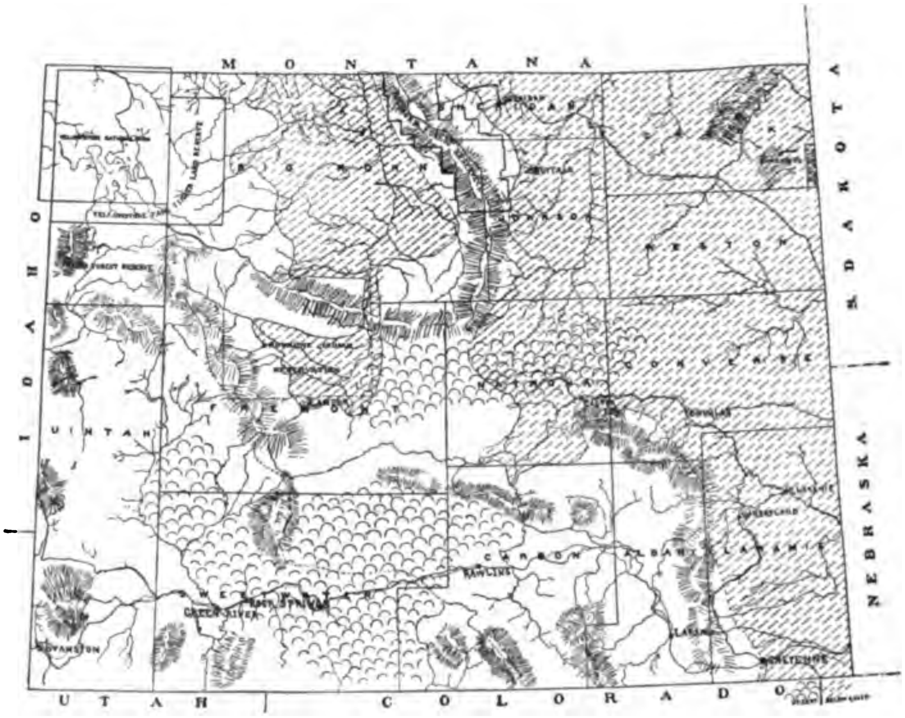
WORMS. Fig. 2749. Under the name of "Worms," "Snails" and "Caterpillars," various odd fruits of leguminous plants are grown as curiosities. The pods are often put in soups as a practical joke, not for their edible qualities. The plants chiefly grown for this purpose are *Scorpiurus vermiculata*, Linn., *S. subvillosa*, Linn., *S. muricata*, Linn., *S. sulcata*, Linn., *Medicago scutellata*, Mill., and *Astragalus hamosus*, Linn. The last is the one usually known as "Worms." The picture, Fig. 2749, shows species of Scorpiurus, chiefly *S. vermiculata* (beneath) and *S. subvillosa* (above). All these various plants are annuals of the easiest culture. They are practically unknown in this country, although offered by seedsmen. See *Caterpillars.*

L. H. B.

WORMSEED. See *Chenopodium.*

2750. Wormwood (× ⅛).

WORMWOOD (*Artemisia Absinthium*). Fig. 2750. An erect, hardy herbaceous perennial, native of middle and western Europe and the countries that bound the Mediterranean, and sometimes found in waste places as an escape from American gardens, having angular, rather shrubby stems 2–4 ft. tall, which bear abundant, much divided, hoary leaves of intensely and persistently bitter flavor, and panicles of greenish or yellowish fl.-heads. The seed, grayish and very small, retains its vitality for about four years, but is usually sown soon after harvesting. The tops and leaves, gathered and dried in July and August when the plant is in flower, are officially credited in America with aromatic, tonic, and, as its name implies, anthelmintic properties, although now, for no apparent reason other than caprice of practice, they are less popular with the profession than formerly. In domestic medicine they are employed as mentioned and as a diuretic; locally as a fomentation or as a decoction with vinegar to ulcers, sprains and bruises. In the dry state they are occasionally placed among clothing as a moth repellant. Formerly Wormwood was used by brewers to embitter and preserve liquors, but at the present time it finds its most extensive use as the principal ingredient in absinthe, in the manufacture of which peppermint, angelica, anise, cloves and cinnamon are also ingredients. According to Blythe, the green color of this liquor is due not to Wormwood but to the chlorophyll of spinach, parsley or nettles. The plant may be grown without trouble in light, dry, rather poor garden soil from seed which, owing to its small size, should be started where it may not be washed out or packed down by rain. When large enough to set out the few specimens necessary to furnish a family supply should be placed not closer than 15 in. each way the first year. If alternate plants be removed with a good ball of earth early in the following spring and planted 30 in. apart, they will be sufficiently close together and the transplanted ones should suffer from no check. Ripened cuttings taken in March or October may be used for propagation. Clean cultivation and slight annual dressings of manure are the only other requisites. In the middle western states there are several localities where Wormwood is grown for export. M. G. KAINS.



2751. Map of Wyoming, showing horticultural possibilities.

The areas marked by semi-circles are deserts. The areas shaded by diagonal lines have an altitude of less than 6,000 feet.

WREATH, PURPLE. See *Petrea volubilis.* **St. Peter's W.** See *Spiræa.*

WYCH ELM. *Ulmus scabra.*

WYOMING, HORTICULTURE IN. Fig. 2751. The agricultural land in Wyoming is at a higher average altitude than that in any other state, being about 6,000 feet above the sea. As shown in the accompanying map more than one-half the total area is above 6,000 feet altitude. This includes the high mountain ranges, which as a rule are covered with forests that catch and hold the winter snow, the melting of which supplies the numerous perennial streams flowing in every direction from the mountain summits. In the north are cultivated areas at less than 3,500 feet altitude, and farming is practiced on high plateaus or in mountain valleys up to 8,000 feet. Wyoming embraces an area 355 miles from east to west and 276 miles from north to south, in the very heart of the Rocky Mountain region. As would be expected, there is great diversity of soil, climate and exposure. There are wind-swept plains, rolling uplands, protected mountain valleys and bottom-lands along streams, with corresponding lengths of the growing season, free from frost, of from eighty days or less to more than one hundred and fifty days. The mean annual temperature varies from less than 40° F. to about 50° F.

The rainfall is as little as 4 or 6 inches per annum in the Red Desert and reaches a maximum of 30 inches or more on the high mountains. The average for the agricultural regions is about 12 inches. With the exception of a very small area in the northeastern part of the state, and small valleys at high altitudes in the mountains, where some quickly growing plants will mature without being artificially watered, no crops can be raised without irrigation. It has been estimated that there is sufficient water supply to reclaim about 12,000,000 acres of agricultural land, and about 2,000,000 acres are already covered by irrigation canals.

The natural conditions make live-stock husbandry of paramount importance. The soil is cultivated principally to increase the amount of stock food and little intensive farming has been inaugurated. Some ranches extend 10–15 miles along the streams, and some of them have not yet known the use of a plow except in the construction of the ditches to irrigate the native meadows. The state is yet in the transition period between the time of the nomadic stockman, or the large stock ranch and range business, and the time of permanent home-building and a stable agriculture. In the last decade the sentiment of the people in regard to cultivating the soil has changed in a marked degree. They are turning their attention to a better agriculture and the production of horticultural crops, both for profit and for greater home comfort.

The state will not reach great commercial importance through her horticultural products, but the people are beginning to appreciate the value of the home-garden and some are raising hardy apples, cherries, grapes, small fruits and vegetables to supply local markets. At the present rate of increase the production of fruits for home consumption will soon be of great importance.

The agricultural land lies along the watercourses, and naturally the first areas to be brought under cultivation were the bottom-lands along the smaller streams where the canals necessary to bring water to the soil could be easily and cheaply constructed. The bench areas, or uplands, have better drainage both for water and air, and are more likely to be free from injurious late and early frosts, than the lowlands near the streams. With the extension of agriculture to the higher bench lands horticultural plants can be raised with more success. The modifying influence of windbreaks makes it possible to grow fruits in a way that was not dreamed of when the country was first settled. Many early plantings of fruit trees failed because of drying winds or late frosts, and in some instances because the plants were drowned by over-irrigating the lowlands where first attempts were made.

Because of the varying conditions, the kinds and varieties of fruits which can be successfully produced vary in different parts of the state. The high plateaus are characterized by frost every month in the year except July, and only such crops can be grown as will stand a degree of frost in the spring months. In the warmer valleys, even up to 5,000 feet altitude, such tender vegetables as tomatoes, melons, sweet potatoes and peanuts have been successfully raised. Where the season is short because of the altitude, plants grow very rapidly, reach maturity in a short time and do not seem to be so seriously affected by light frost as they do where the season of growth is long.

In those portions of the state which are below 6,000 feet in altitude (see map) many varieties of apples, Morello and Rocky Mountain dwarf cherries and plums (varieties from *Prunus Americana*) are fruiting, and hardier kinds are successful at much higher altitudes in protected locations. The Wealthy apple has been successfully fruited on the Laramie Plains at an altitude of 7,400 feet. Tree fruits have been most successfully raised in Fremont, Sheridan, Natrona and Laramie counties, which also produce all the varieties of small fruits usually grown in this altitude.

Above 7,000 feet the only small fruits that succeed well are currants, strawberries, dewberries and gooseberries, named in the order of their apparent hardiness. Because there is not sufficient snowfall to cover the ground and keep it covered during the winter, it is necessary to give winter protection to raspberries, blackberries and grapes by laying down and covering with earth to prevent their parts above ground drying out and dying in the dormant season. Under unfavorable conditions such treatment becomes necessary with strawberries and gooseberries.

Under irrigation the kinds of fruit suitable to the climate produce large crops. Years of failure are rare, and when they do come are traceable to sudden unseasonable changes of temperature, such as late spring frosts or early fall storms before the plants are mature and ready for winter. The first trees were set out in Wyoming between 1882 and 1885. Planting began in earnest in 1892, and every year there is good increase in the area devoted to fruits.

Following is a list of apples which have fruited in the state, arranged as nearly as possible in the order of their apparent hardiness and present abundance: *Standard*—Wealthy, Oldenburg, Antonovka, Gideon, Fameuse, Wolf, Tetofsky, Ben Davis, Transparent, Pewaukee, Pippin. *Crabs*—Siberian, Montreal, Whitney, Martha, Van Wyck, Soulard, Transcendent.

B. C. Buffum.

X

XANTHÍSMA (Greek, *dyed yellow*, referring to the color of the fls.). *Compósitæ*. A genus of only one species, a summer-blooming, yellow-flowered composite with heads 1–1½ in. across, composed of a small disk and about 20 rather slender rays. This plant is known to flower-seed catalogues as *Centauridium Drummondii*. In cultivation the plant is treated like a hardy annual, the seed being sown in the open border early in spring.

Generic characters: fls. all fertile: akenes top-shaped, 4–5-ribbed or angled; pappus persistent, composed of 10 or 12 rigid bristles which are minutely scabrous above, gradually chaffy-dilated towards the base, and longer than the disk-corolla, as many more one-half shorter, and usually 5 still smaller and shorter external ones.

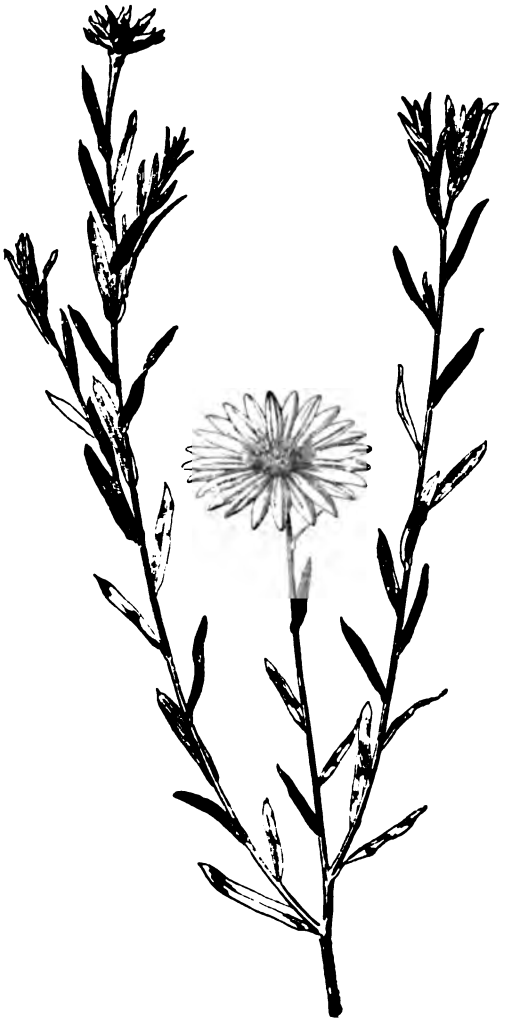
Texànum, DC. (*Centaurídium Drúmmondii*, Torr. & Gray). Fig. 2752. Nearly glabrous biennial or annual, 1–4 ft. high: lvs. narrowly oblong to lanceolate; stem-lvs. entire or with a few teeth toward the apex: fls. attaining a diam. of 2 in. even in the wild. W. M.

XANTHOCÈRAS (Greek, *xanthos*, yellow, and *keras*, horn, alluding to the yellow horn-like processes of the disc). *Sapindàceæ*. Ornamental deciduous shrub or small tree with alternate, odd-pinnate lvs., showy white fls. in terminal and axillary racemes, appearing with the leaves in spring on last year's branches. The large greenish fruits are similar to those of the buckeye. *X. sorbifolia*, the only species, is hardy as far north as Mass., and is a very handsome shrub well suited for solitary planting on the lawn. The dark green, glossy foliage is not attacked by insects and retains its bright color until frost sets in. The flowers are very showy and appear even on small plants. Xanthoceras is also sometimes used for forcing. It is not very particular as to soil. A porous, loamy soil and a sunny position seem to suit it best. Prop. by seeds, stratified and sown in spring, and by root-cuttings, which succeed best with moderate bottom-heat. A monotypic genus from N. China, allied to Ungnadia and Kœlreuteria: fls. polygamous, the upper ones of the terminal raceme pistillate, the lower ones staminate, those of the lateral racemes staminate, with rarely a few pistillate ones at the apex; sepals and petals 5; disc with 4 suberect cylindric horns about half as long as stamens; stamens 8: ovary superior, 3-loculed, with a rather short, thick style: fr. a capsule, with thick walls dehiscent into 3 valves, each locule with several globose, dark brown seeds.

sorbifòlia, Bunge. Figs. 2753, 2754. Shrub or small tree, attaining 15 ft., with rather stout upright branches, glabrous: lvs. 6–12 in. long; lfts. 9–17, usually opposite, sessile, narrow-elliptic to lanceolate, sharply serrate, dark green above, paler beneath, 1–2 in. long: racemes 6–10 in. long: fls. on slender pedicels, white, about ¾ in. across, each petal with a blotch at the base changing from yellow to red: fr. green, 1½–2½ in. long; seeds ½ in. across. May. N. China. B.M. 6923. F.S. 18:1899. R.H. 1872:290; 1898, p. 356. Gn. 8, p. 524 (col. pl. not numbered); 34, p. 372; 50, p. 227. G.C. II. 26:205; III. 2:274, 275; 11:533; 17:197. G.F. 6:285. A.F. 3:109; 12:36. A.G. 18:357. Gng. 2:292–293; 3:289. Mn. 1, p. 27. M.D.G. 1900:592, 593. I.H. 24:295.

ALFRED REHDER.

XANTHORRHŒ̀A (Greek, *yellow flow*, referring to the resin which exudes from the trunks). *Juncàceæ*. The "Grass Trees," "Grass Gums" or "Black Boys," which form a conspicuous feature of the Australian landscape, are among those strange members of the rush family that have a decided trunk or caudex. The Grass Trees often have a trunk 2 or 3 feet high, surmounted by a dense, symmetrical crown of foliage, composed of a multitude of brittle, linear leaves 2–4 ft. long which spread or curve gracefully in all directions. From the center of this tuft of leaves arises a solitary, sceptre-like flower-stalk, terminating in a dense cylindrical spike of numerous, closely packed greenish flowers. These picturesque desert plants are well worth trial in the warmer and more arid regions of the U. S. The trunk varies from almost nothing in some species to 15 ft. in the case of aged specimens of *X. Preissii*. The tall and palm-like trunks are thickly covered with the bases of the old dead leaves, which are cemented together by the black or yellow resinous gum that flows freely from the stems. In Australia the trunks are often charred and discolored by bush fires. The following species have been offered in southern Fla. and southern Calif., but are practically unknown to cultivation in this country. All the species are long-lived perennials native to dry and rocky places. They are said to thrive in a compost of peat and loam and to be propagated by offsets. *X. Preissii* seems to be the most desirable species.



2752. Xanthisma Texanum (× ½).

Xanthorrhœa is a genus of 11 species of Australian plants of the general appearance described above: perianth persistent, of 6 distinct segments, the 3 outer glume-like, erect, concave or almost hooded, 3- or 5-nerved, the 3 inner much thinner, usually 5-nerved, erect, but more or less protruded beyond the outer segments into a short, hyaline or white, petal-like, spreading lamina. Flora Australiensis 7:112.

2753. Xanthoceras sorbifolia (× ⅔). (See p. 1993.)

A. *Trunk very short.*

B. *Spike 3–8 in. long.*

minor, R.Br. Lvs. 1-2 ft. long, 1-2 lines wide: scape longer than the lvs.: spike less than ¾ in. wide. B.M. 6297.—Belongs to the group in which the inner perianth-segments have a white blade conspicuously spreading above the outer ones, while in the next two species the inner segments have a short whitish tip, little longer than the outer and scarcely spreading.

BB. *Spike 1½–2 ft. long.*

hástilis, R.Br. Lvs. 3–4 ft. long, 2–3 lines broad: scape often 6–8 ft. long, not counting the spike. Readily distinguished by the dense, rusty tomentum covering the ends of the bracts and outer perianth-segments. B.M. 4722. G.C. III. 17:196. F.S. 9:868.

AA. *Trunk becoming 5 or 6, or even 15 ft. long.*

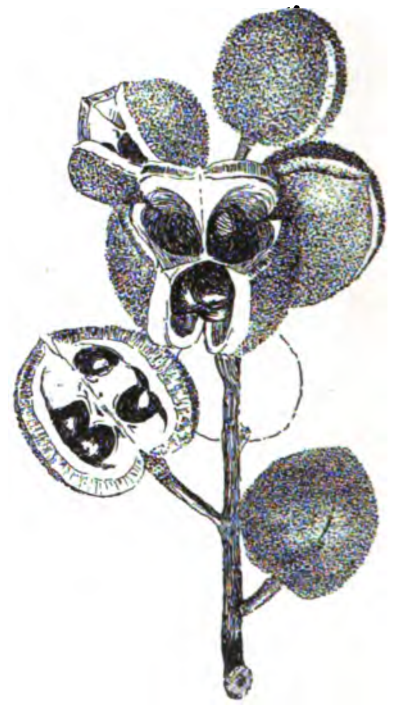
Preissii, Endl. Lvs. 2–4 ft. long, 1–2 lines broad, rigid, very brittle when young: scapes 2–6 ft. long, including the spike, which occupies one-half to nearly all its length. B.M. 6933.

W. M.

XANTHORRHÌZA (Greek, *yellow root*). Often spelled *Zanthorrhiza*. *Ranunculàceæ*. A genus of only one species, native in the eastern United States from New York to Florida. Plant shrubby: lvs. pinnate or bipinnate: fls. in drooping racemes or panicles; sepals 5, petal-like, deciduous; petals 5, smaller than the sepals, and 2-lobed; stamens 5–10; carpels 5–10, sessile, forming only one-seeded follicles, one ovule of each usually not maturing.

The plants are cult. mostly for their handsome foliage, which is much like that of Actæa, and which changes to a beautiful golden color in the autumn. The plants will grow readily in any good soil but usually prefer damp and shady places, although it often thrives in loose, sandy soil. Propagated both by seed and root division in fall or early spring. Often not hardy in Massachusetts.

apiifòlia, L'Herit. SHRUB YELLOW ROOT. Fig. 2755. Stems of bright yellow wood, 1–20 ft. high: roots yellow, sending up suckers in spring: lvs. in clusters from terminal buds; lfts. about 5, cut-toothed or lobed, with wedge-shaped bases and entire sinuses: fls. small, dark or purple. April. Damp and shady places, southwestern New York southward. A.G. 1891:289. B.B. 2:55.—Var. **ternàta**, Huth. Lvs. only ternate; lfts. often more deeply lobed, the sinuses entire. Same distribution.



2754. Fruit of Xanthoceras sorbifolia (× ⅓).

K. C. DAVIS.

XANTHOSÒMA (Greek, *yellow body*, referring to the stigma). *Aràceæ.* This genus is interesting to the horticulturist as containing the handsome variegated stove foliage plant known to the trade as *Phyllotænium Lindeni*, and part of the vegetables known as "Malanga," a crop to which two per cent of the arable land in Porto Rico is devoted. Many species of the arum family are noted for their huge tubers, some of which are edible "after the acrid and more or less poisonous properties are dispersed by the expression of the juice, or by its dissipation through heat" (B. M. 4989). Of this class the best known is the Elephant's Ear, or *Colocasia esculenta*. The Malanga is said to be "little, if at all, inferior to *Caladium esculentum;* in wholesomeness and delicacy far superior to spinach; and in this respect it may vie with any European vegetable whatever."—*Bot. Mag.* The "Yantia Malanga" of Porto Rico is, according to Cook, *Colocasia antiquorum*, var. *esculenta*. Other Yantias are species of Xanthosoma. The botany of them is confused.

Xanthosoma is a genus of 25 species, according to Engler, who has given an account of them in Latin in DC. on Phaner. vol. 2 (1879). They are milky herbs of South and Central America with a tuberous or tall and thick rhizome: lvs. arrow-shaped, 3-cut or pedately cut: fls. unisexual, naked: males with 4–6 stamens connate in an inversely pyramidal synandrium with 5 or 6 faces: ovary 2–4-loculed; ovules anatropous.

A. *Caudex a short, thick, erect rhizome.*

sagittifòlium, Schott (*Àrum sagittifòlium*, Linn.). MALANGA. A tropical vegetable. "Young plants of this are stemless, but in age, from the decay of the old lvs., an annulated caudex is formed some inches in height, each throwing out stout fibers from the base, and from time to time producing offsets, by which the plant is easily propagated, or if suffered to remain the plant becomes tufted, and numerous lvs. are produced from the summit of the short, yet stem-like trunks" (B.M. 4989). Lvs. 1–2 or almost 3 ft. long, broadly sagittate-ovate, suddenly and shortly acute at apex, basal lobes obtuse: spathe large, with a creamy white limb. Tropical Amer. B.M. 4989.—In northern hothouses said to bloom in winter.

2755. Xanthorrhiza apiifolia (× ⅙).

2756. Xanthosoma Lindeni. Leaves a foot or so long.

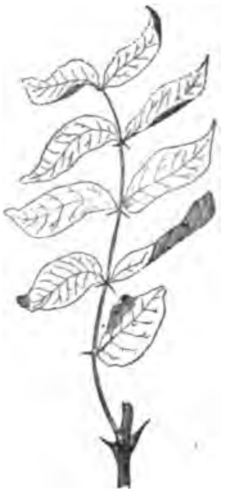
AA. *Caudex tuberous.*

Lindeni, Engl. (*Phyllotænium Lindeni*, André). Fig. 2756. Tender variegated foliage plant with large, arrow-shaped lvs. marked with white along the midrib and parallel veins which run therefrom to the margin. I.H. 19:88. A.G. 19:573 (1898).—Tuberous plant from Colombia. G. W. Oliver, in his "Plant Culture," remarks that this stove ornamental plant should be more used for decorative purposes than it is at present, for it will stand more rough usage than one would suppose. After a goodly number of leaves have been developed in a warm, moist atmosphere, the plants will maintain a good appearance in a greenhouse temperature and may even be used as house plants. The lvs. are firmer in texture than caladiums. Prop. by division. Before repotting, put the pieces in a warm sand-bed to encourage fresh roots. Lvs. oblong-hastate, with acute basal lobes.

X. belophýllum, Kunth, has a short, thick, erect rhizome and a cordate-hastate leaf. Venezuela. Var. Caracasanum, C. Koch (X. Caracasanum, Schott. Colocasia Caracasana, Eng.), has lvs. pale green beneath, the posterior lobes more produced at the apex and the midrib and nerves often rosy. Caracas.—*X. Maƒáffa*, Schott (Colocasia Mafaffa, Hort.), closely allied to the preceding, has a similar caudex and a cordate-ovate leaf but the posterior costæ are separated by a right or acute angle, the angle in the preceding species being obtuse. W. M.

XANTHÓXYLUM (Greek, *xanthos*, yellow, and *xylon*, wood). Sometimes spelled *Zanthoxylum*. Including *Fagara*. *Rutàceæ*. PRICKLY ASH. TOOTHACHE TREE. Ornamental deciduous or evergreen trees and shrubs, mostly prickly, with alternate odd-pinnate or sometimes simple leaves and small greenish or whitish flowers in axillary clusters or terminal panicles followed by small capsular, often ornamental fruits. *X. Americanum* is the only species which is hardy north, but some of the species from E. Asia will probably prove fairly hardy in the middle Atlantic states. As ornamental shrubs they are valued chiefly for their fruits, but some have handsome foliage also, and *X. ailanthoides* is called by Sargent one of the most beautiful trees of Japan. They seem to be not very particular as to soil and position. Prop. by seeds and by suckers or root-cuttings.

The genus contains about 140 species in the tropical and subtropical regions of both hemispheres, and a few in temperate regions. Trees and shrubs, with mostly prickly branches: most parts, particularly the fruits, emit a strong aromatic odor when bruised: lvs. odd-pinnate, 3-foliolate or rarely simple: fls. diœcious or polygamous, small, in cymes or panicles; sepals, petals and stamens 3-8, sepals often wanting; pistils 3-5: fr. composed of 1-5 separate small dehiscent capsules each with 1-2 shining black seeds. Several species are used medicinally. The wood of some W. Indian species and that of the Australian *X. brachyacanthum* is considered valuable. The fruits of *X. piperitum* are used like pepper in Japan.



2757. Leaf of Prickly Ash, Xanthoxylum Americanum (× ⅓).

Showing the stipules and stipels in the form of spines.

Americànum, Mill. (*X. fraxíneum*, Willd. *X. ramiflòrum*, Michx.). PRICKLY ASH. Fig. 2757. Shrub or small tree, attaining 25 ft., with prickly branches: lfts. 5-11, opposite, almost sessile, ovate, entire or crenulate, dark green above, lighter and pubescent beneath, 1½-2 in. long: fls. small, greenish, in axillary sessile cymes, appearing shortly before the lvs.: seeds black Quebec to Neb. and Va. B.B. 2:353.

piperitum, DC. CHINESE or JAPANESE PEPPER. Bushy shrub, rarely small tree: branches with slender prickles: lfts. 11-13, narrow-elliptic to elliptic-lanceolate, serrulate, glabrous, dark green and lustrous above, paler beneath, ¾-1½ in. long: fls. in terminal, rather dense, umbel-like corymbs. July, Aug. Japan, Corea.

X. ailanthoìdes, Sieb. & Zucc. Tree, attaining 60 ft.: branches with numerous short prickles: lvs. 1-4 ft. long; lfts. oblong-ovate, glabrous, glaucous beneath, 3-6 in. long: fls. and fr. in terminal corymbs. Japan. Handsome tree.—*X. Bungeànum*, Maxim. Shrub, with stout, compressed prickles: lvs. prickly; lfts. 7-11, ovate to ovate-lanceolate, glabrous, ¾-1½ in. long: fls. and fr. in terminal corymbs. N. China.—*X. Clava-Hérculis*, Linn. (X. Carolinianum, Lam.). TOOTHACHE-TREE. PEPPER-WOOD. Small tree, attaining 30 or occasionally 50 ft.: lfts. 7-17, ovate-lanceolate, pubescent beneath when young, 1-2½ in. long: fls. and fr. in terminal panicles. April, May. S. Va. to Fla. and Tex. S.S. 1:29.—*X. planispìnum*, Sieb. & Zucc. Shrub, with stout, compressed spines: lfts. 3-5, elliptic to elliptic-lanceolate, serrulate, glabrous, 1-2 in. long: fls. and fr. in small panicles on short lateral branchlets. Japan.—*X. schinifòlium*, Sieb. & Zucc. Shrub, with sparingly prickly branches: lfts. 13-19, elliptic-lanceolate, crenate, emarginate at the apex, ¾-1½ in. long: fls. and fr. in large, terminal corymbs. Japan.

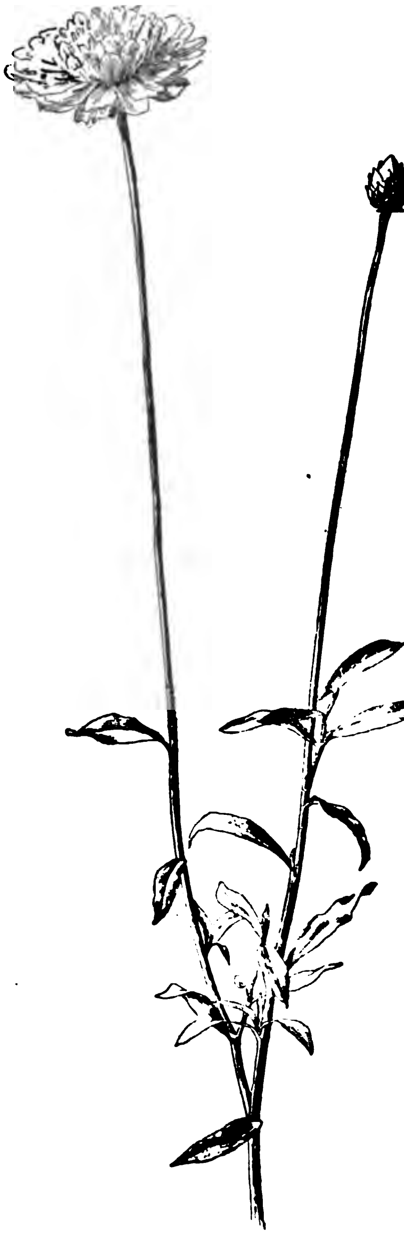
ALFRED REHDER.

XENIA. The immediate influence of pollen—the influence on the fruit that results directly from a given pollination.

XERÁNTHEMUM (Greek, *dry flower:* it is one of the "everlastings"). *Compósitæ.* There are four or five species of Xeranthemum, of which *X. annuum* is one of the oldest and best known of the "everlastings" or immortelles. They are inhabitants of the Mediterranean region. They are annual erect herbs, densely pubescent or tomentose. The heads are rayless, but the large involucre scales are petal-like and persistent, giving the plant its value as a subject for dry bouquets. Outer flowers few and sterile, inner ones fertile; receptacle chaffy; involucral scales in many series, of various lengths, glabrous; heads solitary on long naked peduncles.

The culture of Xeranthemum is very simple. Seeds are usually sown in the open, where the plants are to stand; but they may be started indoors and the seedlings transplanted. Hardy or half-hardy annuals.

ánnuum, Linn. Fig. 2758. Annual, 2-3 ft. tall, erect, white-tomentose: lvs. alternate, oblong-lanceolate, acute, entire: heads purple, 1-1½ in. across, the longer scales wide-spreading and ray-like. S. Europe.—Runs into many varieties. Var. **ligulòsum**, Voss (*X. plenissimum* and *X. imperiàle*, Hort.). A double or half-double form. Var. **perligulòsum**, Voss (*X. superbíssimum*, Hort.), has very full double heads. In these and the single types there are white-fld. (var. *album*), rose-fld. (var. *roseum*) and purple-fld. (var. *purpureum*) varieties. There are also violet-fld. forms. Var. **multiflòrum**, Hort. (var. *compactum*) has a more compact and



2758. Xeranthemum annuum (× ⅔).

bushy habit, with somewhat smaller heads. *X. varius*, Hort., is a trade name for mixed varieties.

X. inápterum, Mill. (X. erectum, Presl.) has white heads of which the scales are little or not at all open or spreading. S. Eu. to S. W. Asia. L. H. B.

XEROPHÝLLUM (Greek, *dry leaf*). *Liliàceæ*. TURKEY'S BEARD. The Turkey's Beard of our eastern states is a strong perennial herb, 3 or 4 ft. high, resembling the asphodel. It has a dense tuft of numerous long, wiry leaves from the center of which springs a stately shaft sometimes 5 ft. high, with an oval or oblong raceme 6 in. long, crowded with yellowish white 6-parted fls., each ¼ in. across. It blooms from May to July, fls. with delicate fragrance lasting a long time. It is a handsomer plant than the asphodel, but, like many other native plants, its beauty was first appreciated in England and it has only lately found favor in American gardens. *X. setifolium*, or *asphodeloides* as it is known to the trade, is considered one of the choicest plants for English bog gardens. The possession of several large clumps is especially to be desired, as each plant flowers so freely that it requires a year or two to recover. Unfortunately the plant does not seed freely and propagation by division is a slow process which must be performed with great care in the spring. It needs a moist and somewhat shaded situation and a peaty soil. The probability is that the Turkey's Beard can be grown in any sandy soil that has been liberally enriched with well-rotted leaf-mold in a spot that is reasonably dry in winter. The species is a native of the dry pine barrens from southern N. J. to eastern Tenn. and Ga. The chief species of the Pacific coast, *X. tenax*, has white and violet flowers, the latter color supplied by the stamens. Each region should cultivate its own species. The forms are too much alike for the same garden. A third species, *S. Douglasii*, is a rare plant ranging from Montana to Oregon. It is distinguished by its 6-valved capsule and is said to be inferior as a garden plant to the other species.

Xerophyllums are tall perennial herbs with short thick, woody rootstocks, unbranched leafy stems and linear, rough-edged leaves, the upper ones shorter than the lower: fls. small, white, in a large, dense raceme, the lower fls. opening first; perianth-segments oblong or ovate, 5–7-nerved, devoid of glands; stamens 6: ovary 3-grooved; styles 3, reflexed or recurved: capsule loculicidally and sometimes also septicidally dehiscent. Watson in Proc. Am. Acad. Arts. Sci. 14:284.

2759. Xerophyllum setifolium growing near the margin of a pond.

A. *Raceme 3–6 in. long or more: perianth-segments exceeding the stamens: lvs. one line or less wide.*

setifòlium, Michx. (*X. asphodeloìdes*, Nutt.). Fig. 2759. A tall hardy perennial herb described above. Varies in height from 1–4 ft. Found in the pine barrens, eastern U. S. B.M. 748 and L.B.C. 4:394 (both as *Helonias asphodeloides*). Gng. 1:173. A.F. 7:171. Gn. 39:808 and p. 527; 27, p. 224; 58, p. 15. G.C. II. 13:433.

AA. *Raceme 1–2 ft. long; perianth-segments scarcely equaling the stamens: lvs. about 2 lines wide: pedicels longer, mostly 1–2 in. long.*

tènax, Nutt. Distinguished from eastern species by characters indicated above. Ranges from Calif. to Brit. Col. and varies in height from 2–5 ft. June, July. B.R. 19:1613 (erroneously as *X. setifolium*). W. M.

XIMÈNIA (Francis Ximenes, Spanish monk, wrote on plants of Mexico in 1615). *Olacàceæ.* Here belongs the Hog Plum, a tropical fruit of minor importance which grows wild throughout the tropics, and in the U. S. is native to Florida south of Tampa Bay. The fruit is about an inch long, shaped like a plum, and the pulp is sweet and aromatic. The "stone" which incloses the seed is proportionately very large. The fruit is borne on a small tree, each branch of which ends in a thorn about ½ in. long. The fruits are generally eaten, but although it is fairly common in Fla. it is not cultivated. The species has been suggested by the American Pomological Society as worthy of cultivation with a view to improvement.

Ximenia is a genus of 8 species of tropical shrubs or trees, often thorny: lvs. alternate, entire, often clustered: fls. whitish, in short axillary cymes or rarely solitary; calyx small, 4-toothed; petals 4, united at the base, villous within; stamens 8: ovary 4-loculed; locules 3-4-ovuled: drupe baccate, not inclosed in the calyx.

Americàna, Linn. HOG PLUM. Also called Mountain or Seaside Plum and False Sandalwood; "Wild Olive" in Jamaica. Tropical fruit-bearing tree described above. Lvs. 2-3 together, oblong, obtuse, short-petioled: peduncles 2-4-fld., shorter than the lvs.: fls. small, yellow; petals thick, lanceolate, rusty-hairy within: fr. yellow; nut white, globose. Tropics.—The "Hog Plum" of Jamaica is *Spondias lutea.*

W. M.

XYLÓSMA longifolium has been offered in southern Florida, but no plants have been sold and the stock has lately been destroyed, as there seems to be no reason for cultivating the plant. It is a bush from the Himalayas and belongs to the family Bixaceæ. See Flora of British India.

2760. Yucca arborescens, the tree Yucca, or "Yucca palm," of the Mojave region.

Y

YAM. See *Dioscorea* and *Sweet Potato*. Circular 21, Div. of Bot., U. S. Dept. Agric., has valuable cultural notes on the introduction of West Indian Yams (Dioscoreas) to subtropical agriculture in the U. S.

YARROW. Consult *Achillea*.

YATE. See *Eucalyptus occidentalis*.

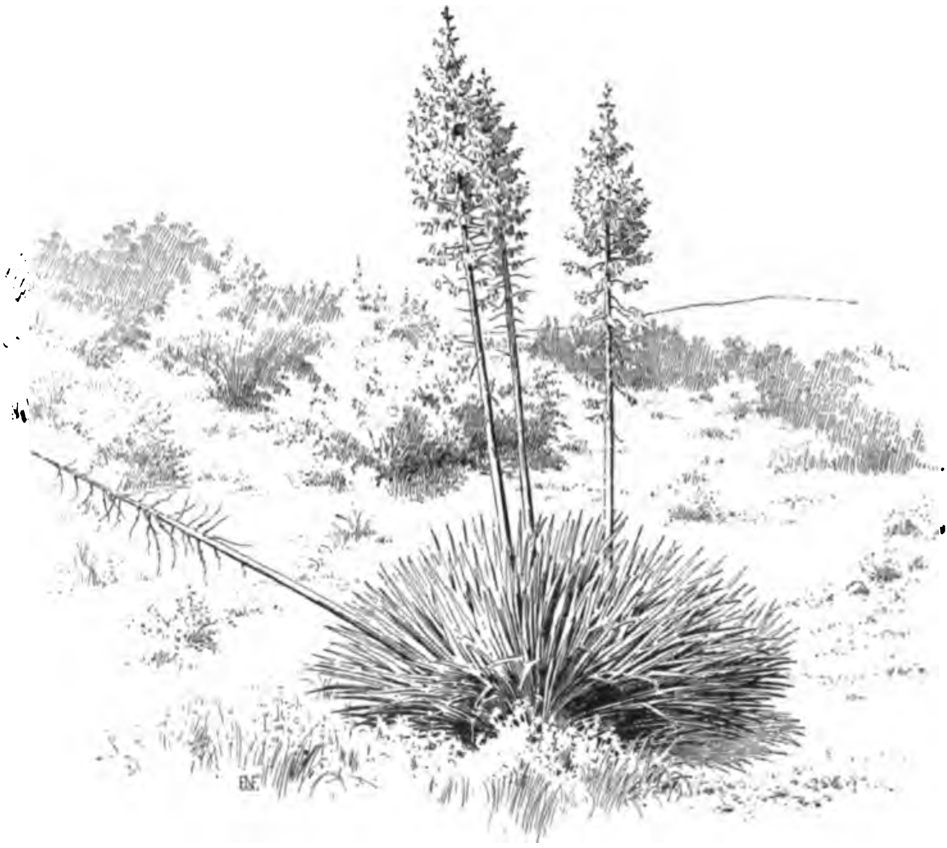
YELLOW ROOT SHRUB. *Xanthorrhiza*.

YELLOW-WOOD. *Cladrastis tinctoria*.

YERBA BUENA. *Micromeria Douglasii*.

YEW. See *Taxus*.

YOUTH-AND-OLD-AGE. *Zinnia*.



2761. Yucca Whipplei.

YÚCCA (Indian name for the Manihot, erroneously applied by Gerarde). *Liliàceæ*. About a dozen species, chiefly of the arid North American table-land and confined to the United States, Mexico and adjacent islands. Evergreens with long, narrow, usually spiny-pointed leaves and panicles of large white nocturnal flowers frequently shaded with green or purple.

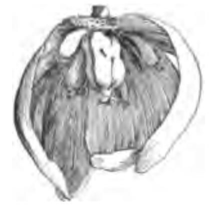
Y. filamentosa, *flaccida*, *baccata*, *gloriosa* in some of its forms, and *glauca* are hardy in the northern states, and *Y. Treculeana* shows considerable resistance to frost. The tender species are kept in the cactus house. Well-drained sandy loam suits them best, but with good drainage they are tolerant of a large range of soil and exposure. Prop. by seeds, offsets, stem-cuttings, and the rhizomes that several species produce, which may be cut into short lengths and rooted in the cutting bench.

Y. Treculeana blooms usually in March in plant houses, as when wild, and the Mexican species when brought to flower are usually spring bloomers, but they often refuse to flower for long periods and then suddenly and unexpectedly produce an abundance of simultaneous bloom, even on the smaller plants. Of the hardy species, *Y. glauca* flowers in June and it is quickly followed by *Y. filamentosa* and *Y. flaccida*, while the forms of *Y. gloriosa*, which usually flower only at intervals of several years, bloom from late August to so late in the autumn as to be cut down by frost.

Most species may be fertilized if fresh pollen is transferred directly from the anther to the stigmatic cavity of a newly opened flower, preferably one seated directly on the main shaft, where nutrition is more certain. *Y. aloifolia* commonly fruits freely, but the others rarely fruit spontaneously in cultivation pt *Y. filamentosa* and *Y. flaccida*, which are pollinated by a small white moth (*Pronuba yuccasella*) that accompanies them when cultivated in the western states, but emerges from the pupa too late to pollinate *Y. glauca* and disappears too early for *Y. gloriosa*. See Rept. Mo. Bot. Gard. 3:99; 4:181.

The great Yuccas, or "Yucca Palms," of southern California (Fig. 2760) are chiefly *Y. arborescens*. They grow in the higher lands bordering the Mojave and adjacent deserts, reaching a height of 15–20 ft. The old plants are exceedingly weird and picturesque. Occasionally this species is transferred to gardens, but it is apparently not in the trade.

2762. Flower of Yucca filamentosa (× ½).



2763. Flower of Yucca Whipplei.

Three petals removed to show structure of blossom.

INDEX.

aloifolia, 6.
Andreana, 5.
angustifolia, 4.
argospatha, 8.
aspera, 8.
baccata, 9.
Californica, 1.
canaliculata, 8.
Carrierei, 5.
concava, 2.
conspicua, 6.
Deleuili, 5.
dracænoides, 5.
Draconis, 6.
elegans, 5.
Ellacombei, 5.
ensifera, 5.
exigua, 3.
filamentosa, 2.
flaccida, 3.
flexilis, 5.
glauca, 4.
gloriosa, 5.
graminifolia, 1.
Guatemalensis, 7.
Hanburyi, 4.
integra, 3.
juncea, 5.
lævigata, 5.
longifolia, 8.
marginata, 5, 6.
Massiliensis, 5.
medio-striata, 5.
nobilis, 5.
orchioides, 3.
Ortgiesiana, 1.
pendula, 5.
plicata, 5.
puberula, 3.
quadricolor, 6.
recurvifolia, 5.
striatula, 5.
stricta, 4.
sulcata, 5.
Treculeana, 8.
Vandervinniana, 8.
variegata, 2, 5.
Whipplei, 1.

A. *Fr. erect, capsular: seeds thin and flat* ....
B. *Stigma capitate, on a slender style*....................... 1. **Whipplei**
BB. *Stigma 3- or 6-lobed, terminating a stout style*....... 2 **filamentosa**
3. **flaccida**
4. **glauca**
AA. *Fr. pendent, not dehiscent.*
B. *Seeds thin: fr. wall thin and soon dry: lvs. usually entire*........................ 5. **gloriosa**
BB. *Seeds thick: fr. pulpy, sweet and edible.*
C. *The fr. without a core, purple-fleshed: lvs. rough-margined*................ 6. **aloifolia**
CC. *The fr. with papery core and yellowish flesh.*
D. *Lvs. rough-margined* ..... 7. **Guatemalensis**
DD. *Lvs. with detaching marginal fibers when adult.* 8. **Treculeana**
9. **baccata**

1. **Whipplei,** Torrey (*Y. graminifòlia*, Wood. *Y. Califórnica* and *Y. Ortgiesiàna*, Hort.). Figs. 2761, 2763. Acaulescent: lvs. ½ in. wide, stiff, flat, striate, glaucous, needle-pointed, rough-margined: panicle very tall, narrow, long-stalked. Coast Range, California. G.C. II. 6:196. Gn. 35, p. 561. R.H. 1886, p. 61. B.M. 7662. Rep. Mo. Bot. Gard. 3, pl. 11, 12, 54. R.H. 1884:324 (as var. *violàcea*). G.F. 8:415.—Grows everywhere in southern Calif. and is a glorious sight when in bloom. It is an easy plant to handle and has been known to flower in three years from seed. Because of its peculiar stigma, this is sometimes placed in a distinct genus, Hesperoyucca.

2. **filamentòsa,** Linn. Figs. 2762, 2764–5; 1052. Sometimes called ADAM'S NEEDLE, BEAR GRASS, SILK GRASS, or THREADY YUCCA. Acaulescent: lvs. 1 in. wide, rather weak, somewhat concave, glaucous when young, short and stout, pointed from the acute apex, with curly marginal fibers: panicle loose, long-stalked: fls. creamy white; style white. Southeastern U. S. B.M. 900. A yellow- or white-margined form is var. **variegàta,** Carr. B.B. 1:427. Var. **concàva,** Engelm. (*Y. concàva*, Haw.). Lvs. broadly spatulate, plicate, concave. N. C.

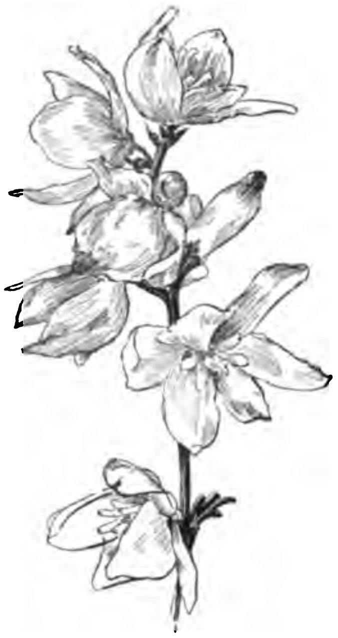
3. **fláccida,** Haw. (*Y. pubérula*, Haw. *Y. orchioìdes*, Carr.). Lvs. more flexible, recurving, not pungent, gradually tapering, with thinner and less curly fibers. Eastern U. S. B.R. 22:1895. B.M. 6316.—Usually cultivated for the preceding, and comprising several forms. Vars. **exigua** and **intègra** have the leaf-margin brown, without detaching fibers.

4. **glaùca,** Nutt. (*Y. angustifòlia*, Pursh. *Y. Hánburyi*, Baker). Fig. 2766. Lvs. less than ½ in. wide, thin but stiff, flat, acutely and pungently pointed, with white margin from which slender fibers detach themselves, whitish green: panicle with 1 or 2 short branches within the cluster of leaves, or usually reduced to a raceme: fls. greenish; style green. Rocky mountain region and plains. B.M. 2236. G.F. 2:247. Rept. Mo. Bot. Gard. 6, p. 7. B.B. 1:427.—Var. **stricta,** Trel. (*Y. stricta*, Sims). Inflorescence freely branched at top of the leaf-cluster. Southern plains. B.M. 2222.

5. **gloriòsa,** Linn. Nearly stemless or with slender trunk, 10–15 ft. high: lvs. 1–2 in. wide, thin but not recurved, somewhat concave, glaucous when young, pungently pointed, brown-margined: panicle with ascending branches, short-peduncled: fls. often with a reddish or brownish shading. Carolina coast region.—A form

2764. Adam's Needle—Yucca filamentosa. From a plant 4 feet high.

with median whitish stripe on the lvs. is var. **mèdio-striàta,** Planch. Among the numerous varieties and forms into which this, the first-cultivated Yucca, has sported, the following are most worthy: Var. **plicàta,** Carr. Lvs. very glaucous, strongly plicate. G.C. III. 15:304. Rep. Mo. Bot. Gard. 3, pl. 6. Var. **recurvifòlia,** Engelm. (*Y. recurvifòlia*, Salisb. *Y. recurva*, Haw. *Y. pèndula*, Hort.). Fig. 2767. Lvs. less plicate, soon green, gracefully recurved, occasionally with a few detaching marginal threads. Carolina coast region. Gn. 47, p. 337. R.H. 1858, p. 433; 1859, p. 488. Variegated forms of this are the following: Var. **marginàta,** Carr. Lvs. yellow-margined; var. **variegàta,** Carr. Lvs. with yellow median band; and var. **élegans,** Hort. Lvs. with reddish median band. Var. **nóbilis,** Carr. (*Y. Ellacòmbei*, Bak.). Lvs. glaucous, not plicate, less recurved. Var. **fléxilis,** Trel. (*Y. fléxilis*, Carr.). Lvs. long, narrow, less than an inch wide, scarcely plicate, glossy green, gracefully recurved, occasionally a little rough on the margin.—Hybrids of *Y. gloriosa* with both capsular and fleshy-fruited species have been artificially produced in Europe, and are in some European gardens under the names *Y. Deleuili*, *Y. sulcata*, *Y. Carrierei*, *Y. Andreana*, *Y. dracænoides*, *Y. striatula*, *Y. Massiliensis*, *Y. ensifera*, *Y. lævigata* and *Y. juncea*. R.H. 1886, p. 63; 1895, p. 81. For descriptions see R.H. 1893, p. 109. Other hybrids not yet in the trade have more lately been produced by Sprenger, of Naples.

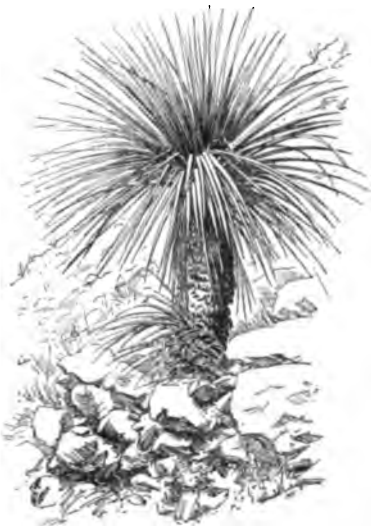


2765. Flowers of Yucca filamentosa (× ⅛).

6. **aloifòlia,** Linn. Slender simple trunk 10–15 ft. high: lvs. dagger-shaped, 1–2 in. wide, flat, very stiff and pungent, not plicate: panicle compact, close to the lvs.: fls. white, often tinged with green or purple; ovary distinctly stalked. Southeastern U. S. and West Indies. B.M. 1700.—Variegated forms are: Var. **marginàta,** Bommer. Lvs. with yellow margin, and often when young also tinged with rose. Var. **quadricolor,** Hort. Lvs. with median yellow band, and also when young with rosy coloration. Var. **Dracònis,** Engelm. (*Y. Dracònis*, Linn.). Branching above. Lvs. broad and arching, less pungent. B.R. 22:1894. Var. **conspicua,** Engelm. (*Y. conspicua*, Haw.). Tall, the stems clustered at base: lvs. broad, recurved, softly green-pointed.

7. **Guatemalénsis,** Baker. Tall, swollen at base, branching above in age: lvs. about 3 in. wide, flat, glossy green, sometimes plicate, rather thin but scarcely recurved: panicle compact, close to the lvs. Guatemala. G.C. III. 18, 519, 523, 525. Rep. Mo. Bot. Gard. 4, pl. 1, 2, 19.

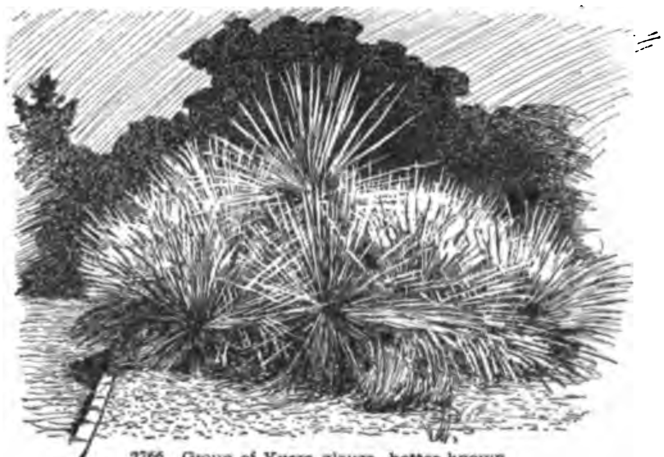
8. **Treculeàna,** Carr. (*Y. canaliculàta*, Hook. *Y. áspera*, Regel. *Y. longifòlia*, Buckley. *Y. Vandervinniàna*, Koch. *Y. argospàtha*, Ver'ot). Low tree, usually loosely branched in cultivation: lvs. thick and very rigid, deeply concave, rough, blue-green, at length with a few fine fibers detaching from the brown margin: panicle short-stalked, compact. S.W. Tex. to N. E. Mexico. B.M. 5201.



2767. Yucca gloriosa, var. recurvifolia.

9. **baccàta,** Torrey. SPANISH BAYONET. Low, from a stout running caudex: lvs. of a yellower green, with very thick marginal threads: panicle rather loose within the leaf-cluster: fls. and fruit very large. S. Colo. to Ariz. B.B. 1:426.

WM. TRELEASE.



2766. Group of Yucca glauca, better known as Y. angustifolia.

Z

ZALUZIÁNSKYA (after a Pole, who wrote Methodus Herbariæ, Prague, 1592). Including *Nycterinia*, *Scrophulariàceæ*. About 16 species of S. African herbs and subshrubs, including three plants known as Night Balsams or Star Balsams, from their night-blooming habit. The name Night-blooming Phlox would be better, as the flowers are salver-shaped and 5-lobed, each lobe being deeply cut. These plants are generally treated as half-hardy annuals, the seed being sown indoors in early spring. The plants bloom in about ten weeks after being set out and continue in flower through July and August. Some cultivators declare that this method is very unsatisfactory and urge that the seed be sown in the autumn and the young plants wintered in a coldframe. They will then begin to flower by June. The blossoms are closed by day and are fragrant by night.

Zaluzianskyas are more or less viscous plants: lowest lvs. opposite, upper ones alternate, usually few-toothed: fls. sessile but long-tubed, disposed in leafy spikes which are cylindrical or flattish; calyx 5-toothed, 2-lipped or 2-parted; corolla persistent, the 5 lobes entire or 2-fid, equal or the 2 posterior ones a little wider; stamens usually 4; style club-shaped: capsule oblong, leathery or membranous. The Zaluzianskyas are little known in American gardens. The botanical status of the group is in need of revision.

A promise was made to give some account under Zaluzianskya of the puzzling trade names *Erinus duplex*, *gracilis*, *Paxtoniana* and *speciosa*. It is probable that these are all varieties of *Erinus alpinus*. In the American trade they are considered as trailing plants suitable for hanging-baskets, vases and window boxes, uses to which *Erinus alpinus* is eminently adapted. *E. speciosa* is said to have ultramarine blue fls.; *E. gracilis*, light blue fls. and a spreading habit: *E. Paxtoniana*, pure white fls., blue-edged; *E. duplex*, double blue fls. *Erinus gracilis* of the botanists is a true Zaluzianskya, being a synonym of *Z. lychnidea*, a plant of erect habit with white fls. that are violet outside Although Erinus and Zaluzianskya are placed in different tribes of the figwort family, it is difficult to separate them by any one important botanical character unless it be the shape of the stamens, which is oblong in Zaluzianskya, reniform in Erinus. The horticulturist, however, may readily distinguish them by the lowest leaves, those of the former being opposite, those of the latter tufted. To the account of Erinus in Vol. II, p. 543, should be added the fact that the genus has only one species. The other names which appear to be good species of Erinus in Index Kewensis are presumably to be referred to other genera, as they are mostly South African plants,—Europe and the Cape having few genera in common.

All the species mentioned below have their corolla-lobes bifid.

A. *Corolla-tube slightly pubescent.*

B. *Duration perennial: bracts broadly lanceolate: lvs. oblong-linear.*

lychnidea, Walp. (*Nycterínia lychnídea*, D. Don. *Erínus grácilis*, Lehm., not Hort.). Subshrub, 2 ft. high, with fls. 1½ in. long, ¾ in. across, white, violet outside. B.M. 2504. B.R. 9:748 (both as *Erinus lychnidea*).

BB. *Duration annual: bracts oblong-lanceolate: lvs. linear or the lower ones lanceolate.*

Capénsis, Walp. (*Nycterínia Capénsis*, Benth.). Differs from the above, according to Bentham, in stature, duration, strict stems and smaller lvs., but unfortunately Bentham does not give the height of the plant or color of the fls. According to R.H. 1851:221, the plant has white or lilac flower-clusters on the same plant, each flower having an orange eye. The spikes, according to Bentham, are commonly short and 4–8-fld., sometimes long and 15–20-fld. There is some evidence that this species and the next are confused in the trade. In R.H. 1851:221 the fls. are ¾–1 in. long and less than ⅓ in. across.

AA. *Corolla-tube glabrous.*

selaginoides, Walp. (*Nycterínia selaginoìdes*, Benth.). Dwarf annual, branched at the base, 3–5 in. high, rarely 6 in., with spatulate lvs. and fls. ¾–1 in. long, color of fls. not stated by Bentham. but in R.H. 1896, p. 308 (same picture as Gn. 24, p. 89) the fls. are said to range from white to lilac and darker depending upon their stage of development, with an orange-colored eye which becomes crimson later. This suggests the preceding species, and it is evident that the two must be distinguished by technical characters until the colors can be verified. The plant advertised in America as *Nycterinia selaginoides* is said to be a pink-fld., half-hardy perennial, growing 9 in. high, which does not agree with authentic descriptions. A species passing under this name is hardy at San Francisco. W. M.

ZÀMIA (name used by Pliny, meaning *loss* or *damage*, and first applied to barren pine cones, and transferred to these plants apparently because of the cone-like fructification). *Cycadàceæ*. One of the nine genera of the Cycas family, as constituted by Alphonse De Candolle (Prodr. 16, pt. 2, pp. 522–547). Other genera of horticultural interest and discussed in this Cyclopedia are Ceratozamia, Cycas, Dioon, Encephalartos and Macrozamia. The Zamias are stocky short- and usually simple-stemmed cycas-like plants, the trunk sometimes subterranean, with long-pinnate evergreen leaves or fronds, the leaflets being thickened and usually broadened at the base, and jointed. There are about 30 species in the American tropics, and two are native to Florida. The flowers of cycads are diœcious, without envelopes; the pistillate flowers are mere naked ovules inserted under scales in cones. and the staminate flowers are simple anthers under similar scales. The plants are therefore gymnosperms (seeds naked or not inclosed in a pericarp or ripened ovary) and are allied to the conifers. The fruit is a berry-like drupe. In Zamia the floral scales are peltate (and not horned) and form a cylindrical cone; the anthers are numerous, and the ovules pendulous in pairs. Leaves nearly straight in venation. The fecundation of Zamia has been studied by H. J. Webber (Bull. 2, Bureau of Plant Ind. U. S. Dept. Agr.). His conclusions respecting the Floridian species are accepted below.

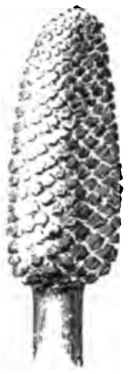
2768. Zamia Floridana.

Zamias are warmhouse plants, to be treated like species of Cycas or Encephalartos, which see. The plants are propagated by means of seeds and offsets; also by division when there is more than one crown.

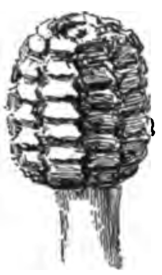
A. *Petiole prickly.*

furfuràcea, Ait. Trunk cylindrical, 1–2 ft. tall: petioles dilated and concave at the base, with several small prickles: lfts. about 10–12 pairs, opposite or alternate, oblanceolate, entire on the lower half but serrate or jagged towards the top, acute or obtuse, scurfy beneath (as also the rachis): cone oval-conical, downy, pedunculate, pale yellowish brown, the pistillate ones 4 in. or less long. Mexico. B.M. 1969.

Lindeni, Regel. Trunk cylindrical, 2–4 ft. or more tall when well grown: petioles long, cylindrical, sparsely provided with tawny wool, the prickles short conical and spreading: lfts. 20 or more pairs, glabrous or somewhat puberulous, nearly or quite opposite, sessile, long-lanceolate and acuminate, dentate-serrate towards the top. Ecuador. I.H. 22:195.



2769. Staminate cone of Zamia Floridana.



2770. Pistillate cone of Zamia Floridana.

AA. *Petiole not prickly.*

B. *Species growing beyond the limits of the U. S*

integrifòlia, Ait. Trunk 12–18 in. tall, erect, globular or oblong: lvs. glabrous: lfts. alternate, 7–16 pairs, oblong to linear-lanceolate to lanceolate, mostly obtuse, entire or somewhat dentate towards the apex: cones oblong and obtuse, short-peduncled. West Indies. B.M. 1851.—The Florida plants, usually referred here, are apparently all *Z. Floridana* and *Z. pumila.*

Mexicàna, Miq. Distinguished by DeCandolle as follows: scales of the leaf-buds tomentose and also the petioles at the base, the petioles 3-cornered, unarmed, glabrous, somewhat warty: lfts. of 9 or more pairs, sub-opposite, narrow-lanceolate, straight or slightly curved, acute or acutish, rigidly coriaceous, dark green, many-nerved, spinulose-serrulate from the middle to the apex. Mex.—By Index Kewensis referred to *Z. Loddigesii*, a species with prickly petioles.

Pseùdo-parasítica, Yates (*Z. Rœzlii*, Regel). Distinguished as follows by DeCandolle: trunk cylindrical: lfts. lanceolate, sinuose-falcate, entire, glabrous, acute at the base, cuspidate at the apex, with 18 strong nerves which are twice bifurcate. Panama.—Grows on tree trunks.

angustifòlia, Jacq. Foliage glabrous when mature: lfts. 5 in. long, 4–20 pairs, usually alternate, elongated and narrowly linear, the apex obtuse and very obscurely serrulate or entire, the base not narrowed, 6–8-nerved: pistillate cone obtuse but cuspidate. Bahamas, Cuba.

BB. *Species native to Florida.*

Floridàna, DC. COONTIE. COMPTIE. Figs. 2768–71. Lvs. ovate or ovate-lanceolate; petiole triangular in outline, sericeo-tomentose at base, with scattered hairs above; lfts. mostly opposite, 14–20 pairs, glabrous above and with scattered hairs beneath, linear, falcate and somewhat twisted, narrowed at the base and obtuse at the apex, the margin revolute and with a few obscure teeth: mature pistillate cones oblong, 5–6 in. (12–16½ cm.) long, markedly umbonate (projection on the scales), densely tomentose.—Very abundant in southern Florida on the east coast below lat. 26° 30′, in open comparatively dry pine woods.

pùmila, Linn. Differs, according to Webber, in having shorter and broader leaflets which are less twisted and not so erect and rigid, and in its shorter and non-umbonate cones with seed-bearing scales thinner and more flattened at outer end.—Abundant in central Florida, ranging from 28° 30′ north for one degree of latitude, in dense moist woods.

Z. corállipes, Versch., is Macrozamia spiralis.—*Z. Dénnisoni*, F. Muell., is Macrozamia Peroffskyana.—*Z. glaùca*, Hort. =Cycas Rumphii?—*Z. púngens*, Ait.=Encephalartos pungens. —*Z. spinòsa*, Lodd.=Encephalartos Altensteinii. L. H. B.

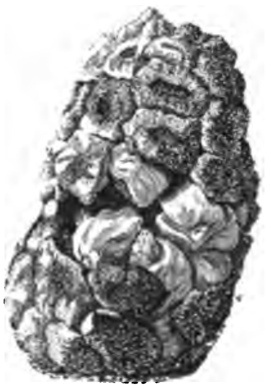
ZANNICHÉLLIA palùstris, Linn. (*Naiadàceæ*), or Horned Pondweed, is offered by collectors of native plants, but has little horticultural value. It is a hardy aquatic plant (probably annual) widely distributed in the New and Old Worlds. It has thread-like submerged lvs. 1–3 in. long and flowers and fruits under water. It is found in fresh or brackish water. B.B. 1:80.

ZANTE CURRANT. See *Raisin*, page 1496.

ZANTHORRHÌZA. See *Xanthorrhiza.*

ZANTHÓXYLUM. See *Xanthoxylum.*

ZAUSCHNÈRIA (named for a professor of natural history at Prague). *Onagràceæ.* The CALIFORNIA FUCHSIA, or HUMMINGBIRD'S TRUMPET, is a half-hardy perennial plant ¾–2 ft. high, with drooping, trumpet-shaped vermilion fls. 1½ in. across and under 1 in. wide at the mouth. It is the calyx which forms the showy trumpet, and its 4 acute lobes are rather larger than the 4 petals, which are obcordate and inserted at the throat of the calyx-tube. The length of the calyx distinguishes this genus from Epilobium, to which Zauschneria is closely allied by reason of its 4 petals, 8 stamens, 4-loculed ovary and comose seeds. The genus has only one species, but this varies greatly in the width of lvs. and hairiness. Varieties have been made based upon linear, lanceolate or ovate lvs., but they run into one another. The plants also vary from glabrous and pubescent to tomentose. As a bedding plant it has been occasionally used for novelty effects by European gardeners. To overcome its thin and leggy habit, it is well to set the plants rather closely and pinch out the young shoots until compact bushes are secured. The plant is sometimes grown in pots for greenhouse decoration in late autumn. There are said to be forms that vary considerably in hardiness. The plant is hardy in most parts of England with slight winter covering. In favored spots it is considered to be a choice plant of pendent habit for the steep sides of rockeries and for naturalizing on old walls. In light and dry soils it spreads underground like the epilobiums. It is prop. by division, by cuttings made in autumn and wintered in a coldframe, or by seeds sown in early spring in mild heat. In California the plant is considered objectionable on account of the unkempt appearance produced by the woolly seeds. It is remarkably resistant to drought.



2771. Aggregate fruit of Zamia Floridana (× ⅓). Cone not mature

Califórnica, Presl. CALIFORNIA FUCHSIA. HUMMINGBIRD'S TRUMPET. Half-hardy perennial with the flower of a Fuchsia and the fruit of an Epilobium: height

¾–2 ft.: lvs. linear to ovate, ½–1½ in. long, glabrous, pubescent or tomentose: fls. scarlet or vermilion, the trumpet-shaped calyx 1½ in. long: calyx-lobes ovate; petals obcordate, spreading: fr. 4-valved, imperfectly 4-loculed. B. M. 4493. F. S. 4: 404. P. M. 15: 195. F. 1847–48: 241. Gn. 31, p. 29; 31:578. R.H. 1849:141.

W. M.

2772. Indian Corn — Zea Mays.

ZEA (an old Greek name for some common cereal, probably spelt). *Gramineæ.* As now limited the genus is founded upon the single polymorphous cultivated species *Zea Mays*, Maize or Indian Corn (Figs. 2772, 2773), whose origin is unknown but is suspected by some to be Teosinte (*Euchlæna luxurians*). Most of the evidence points to Mexico as the region in which it originated and from which it spread. Under the head of *Corn* are given the botanical characters of the genus, a classification of subspecies of *Zea Mays*, and a discussion of Sweet Corn and Pop Corn. A picture of a staminate flower is given in connection with the article *Grass* (Fig. 984, p. 683). Hackel ("The True Grasses") explains the fructification of Maize as follows: "The pistillate spikes (originally by monstrous or teratological development?) are grown together into a spongy, continuous, club-shaped body (the cob) upon which the 4–11 double rows (each sessile upon a low longitudinal elevation that is limited by a long, shallow furrow on each side) correspond to a single spike of Euchlæna. Grain developed at the expense of the other parts, projecting beyond the thin bracts, which rarely become coriaceous and inclose it." Fig. 2773. The staminate flowers are in the "tassel."

Dent or Field Corn (*Z. indentata*, of Sturtevant). The bulk of the Corn raised for home use and for export belongs to this subspecies. It is characterized by the presence of horny or corneous endosperm along the sides of the grain, while the starchy endosperm extends to the summit. In drying, the floury portion shrinks more than the horny, and this gives rise to the dent at the summit. Both the horny and the floury portion of the endosperm consist of starch, but the former is more compact. The varieties vary greatly in size of plants and appearance of the ear, but in general the plant and the ear are both larger than the Sweet or Flint Corns. The color of the kernels varies, the chief color varieties being white, yellow, and calico, the latter mottled with red; red varieties are less common, but red ears occasionally occur in all varieties.

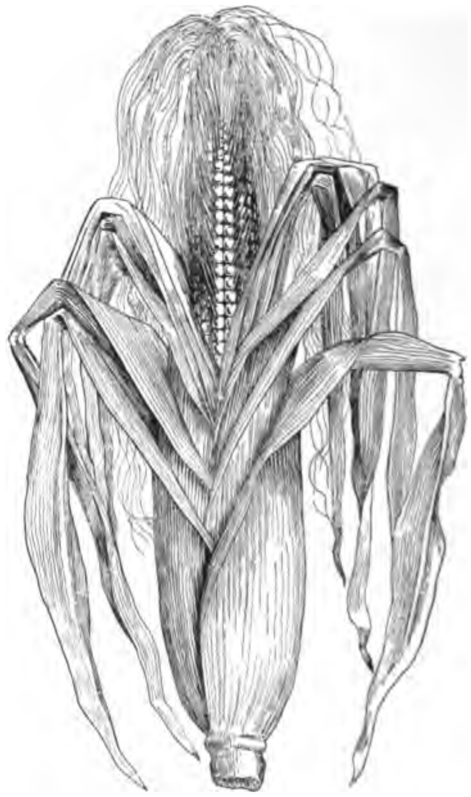
Flint Corn (*Z. indurata*, Sturt.). Kernel with horny endosperm enveloping a starchy or floury portion, this being hard and flinty and with no dent at apex. Ears in most varieties smaller and rows fewer (often 8) than in the Dent Corn. Color of kernel white, yellow, red, blue, and variegated. Commonly cultivated through the northern portions of our country and in Canada, where the seasons are too short for Dent Corn. Has been grown as far north as 50°.

Soft Corn (*Z. amylacea*, Sturt.). Kernels without horny or corneous endosperm, hence shrinking uniformly. Seems to have been commonly grown by the Indians in many localities of both North and South America. At present it is cultivated to only a limited extent in the United States. Brazilian Flour Corn sold by seedsmen is a type of the Soft Corn.

Pod Corn (*Z. tunicata*, Sturt.) is sometimes grown as a curiosity. Each kernel is inclosed in a small husk and the whole ear again inclosed in the usual husk.

A form of Flint Corn with variegated leaves goes under the name of *Zea Japonica*, or Japanese striped Corn. *Z. quadricola* and *Z. gracillima* are seedsmen's names for other similar forms, the former being variegated and the latter dwarf.

For cultural account, see *Corn*. A. S. Hitchcock.



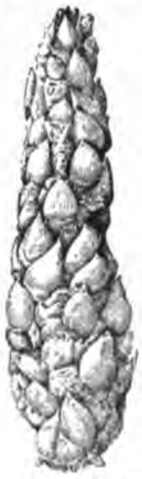
2773. Ear or pistillate spike of Maize.

The husks are a kind of involucre. Each kernel represents a flower. The "silks" are styles.

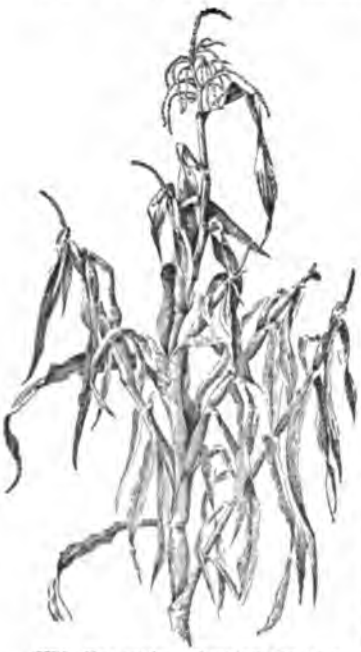
The origin of Maize is still a mystery. All evidence points to an American nativity, but the original form of the species is not identified. Many persons believe that the wild original will yet be found somewhere from Mexico south. Others suppose that Maize originated

from the Teosinte (*Euchlæna Mexicana*), a fodder grass that is much grown in Mexico. See *Teosinte*. This latter view has arisen from experiments in crossing Teosinte and Maize, whereby a maize-like plant has been produced, thus showing the very close affinity of the two species. Plants of this hybrid were thought by the late Sereno Watson and others to constitute a new species of Zea, and Watson named it *Z. canina*. This plant quickly reverts to ordinary Corn when grown in the North (see Harshberger, G. F. 9:522; Contr. Bot. Lab. Univ. Penn. 2:231. Also Bailey, Bull. 49, Cornell Exp. Sta.). Figs. 2774, 2775. *Zea Mays*, therefore, may be (1) a true species, of which the wild prototype is unknown; (2) a direct offshoot by domestication of *Euchlæna Mexicana;* (3) a product of crossing between *Euchlæna Mexicana* and some unknown related species; (4) a product of crossing between *Euchlæna Mexicana* and a domesticated race of the same species. Our knowledge is yet insufficient to enable us to offer much more than conjecture on these categories.

Maize is remarkably variable, although most of the variations intergrade in different regions and under different conditions. The most extended American study of variation and varieties in Maize has been made by the late Dr. E. Lewis Sturtevant. The summary of his study of varieties is published as Bull. 57, Office of Experiment Stations, U. S. Dept. of Agric. ("Varieties of Corn," 1899). Sturtevant throws the varieties of Maize into seven "species groups" or "agricultural species." The distinguishing characters of these groups are founded on the kernels. Aside from these there is at least one well-marked race of ornamental maize, *Zea Japonica*, which for horticultural purposes may well be separated from the others. In the following classification, the characters of the races, except of the ornamental sorts, are copied from Sturtevant. It is probable that a strict inquiry into the nomenclature of *Zea Mays* would find other names to replace some of those given by Sturtevant; but his names have the great merits of definiteness and of applicability to American forms of Maize.



2775. **Ear of Zea canina, second year from the wild. Cob flattish (× ⅔).**



2774. **Zea canina, showing the long branches, with ears at the joints.**

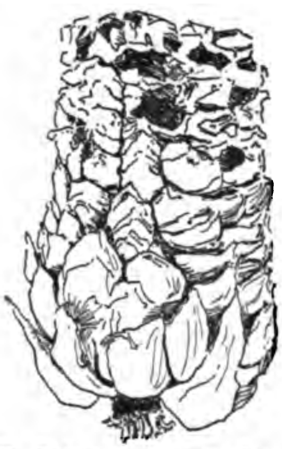
Zèa Màys, Linn. MAIZE. INDIAN CORN. A composite species, of which no single form can be taken as the type. Linnæus meant the name to cover the whole range of forms then grown in European gardens. Tender annual. If an original specific form of Maize were to be discovered, this form would no doubt be taken as the type, and all other forms ranged as varieties of it.

A. *Maize grown for ornament.*

Var. **Japónica,** Koern. (*Z. Japónica*, Van Houtte. *Z. vittàta*, Hort.). Foliage variously striped with white: plant small. Said to have come from Japan. F.S. 16:1673–4. Ears small; kernels yellowish, flint.

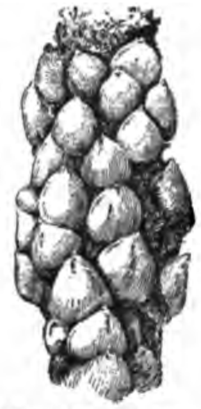
Var. **gracillima,** Koern. (*Z. gracillima* and *Z. mínima*, Hort.). Very dwarf, slender form with green lvs., sometimes cult. in Eu. A variety *variegata* is also mentioned.

Var. **Curágua,** Hort. (*Z. Curágua*, Molina), is described as a very robust green-leaved form. Sturtevant places it in the Pop Corn tribe. Gn. 42, p. 207.



2777. **Pod or Husk Corn.—Zea Mays, var. tunicata (× ⅓).**

Each kernel inclosed in a husk.



2776. **Zea canina, third year from the wild. Kernels less pointed. Cob nearly cylindrical (× ⅔).**

AA. *Maize grown primarily for the grain or fruit.*

Var. **tunicàta** (*Z. tunicàta*, Sturt.). POD CORN. Figs. 2777, 2778. Plate VII. In this group each kernel is inclosed in a pod or husk, and the ear thus formed is inclosed in husks.

Var. **evérta** (*Z. evérta*, Sturt.). POP CORN. Fig. 551, Vol. I. Plate VII. This group is characterized by the excessive proportion of the corneous endosperm and the small size of the kernels and ear. The best varieties have a corneous endosperm throughout. This gives the property of popping, which is the complete eversion or turning inside out of the kernel through the explosion of the contained moisture on application of heat. A small deposit of starchy endosperm does not greatly interfere with this property of popping, but when the starchy endosperm is in excess, as in a flint Corn, the kernel does not evert, but the corneous portion only explodes or splits, leaving the starchy portion unchanged. The true Pop Corn is hence tender in its eating; the false Pop Corn has a tender portion of limited extent only. This class of Corns is even more readily recognized by inspection than by description.

Var. **induràta** (*Z. induràta*, Sturt.). FLINT CORN. Plate VII. Fig. 2779. A group readily recognized by the occurrence of a starchy endosperm, inclosed in a corneous endosperm, as shown in a split seed. This corneous endosperm varies in thickness with varieties. When very thin at the summit of the kernel the shrinkage of the starchy endosperm may cause a depression, thus simulating externally a dent from which its structure at once differentiates it.

2778. **Cross-section of ear of Husk Corn (× ½).**

Var. **indentàta** (*Z. indentàta*, Sturt.). DENT CORN. Fig. 2780. Plate VII. A group recognized by the presence of corneous endosperm at the sides of the kernel, the starchy endosperm extending to the summit. By the drying and shrinkage of the starchy matter the summit of the kernel is drawn in or together, and indented in various forms. In different varieties the corneous endosperm varies in height and thickness, thus determining the character of the indented surface.

2779. Flint Corn. Var. indurata (× ⅓).

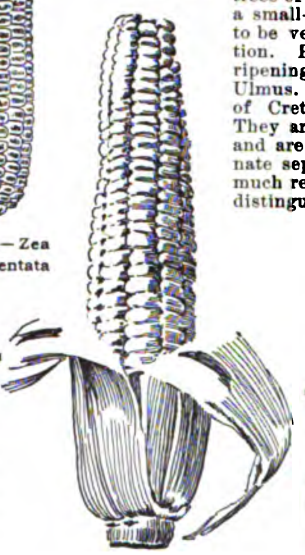
2780. Dent Corn — Zea Mays, var. indentata (× ⅓).

Var. **amylàcea** (*Z. amylàcea*, Sturt.). SOFT CORNS. This group is at once recognized by the absence of corneous endosperm. Through the uniformity of the shrinkage in ripening there is usually no indentation, yet in some varieties an indentation may more or less frequently appear, but splitting the kernel infallibly determines the class.

Var. **saccharàta** (*Z. saccharàta*, Sturt.). SWEET CORN. Figs. 2781, 2782, 551. Plate VII. A well-defined group characterized by the translucent, horny appearance of the kernels and their more or less crinkled, wrinkled, or shriveled condition.

Var. **amỳlea-saccharàta** (*Z. amỳlea-saccharàta*, Sturt.). STARCHY-SWEET CORN. This group is founded upon three varieties found in the San Pedro Indian collection of Dr. Palmer and sent in 1886. The external appearance of the kernel is that of a sweet, but examination shows that the lower half of the kernel is starchy, the upper half horny and translucent. These varieties all had a white cob, the kernels deeper than broad.

L. H. B.


2781. Sugar or Sweet Corn — Zea Mays, var. saccharata (× ⅓).

A green ear, with unshrunken kernels.

ZEBRÌNA (name refers to the striped leaves). *Commelinàceæ.* Differs from Tradescantia chiefly in the fact that the corolla is tubular (petals not free); stamens 6, equal; fls. few, sessile, in 2 conduplicate bracts. Two species.

péndula, Schnizl (*Tradescántia zebrìna*, Hort. *T. tricolor*, Hort., in part. *Cyanòtis vittàta*, Lindl. *Commelìna zebrìna*, Hort.). WANDERING JEW, in part. Figs. 2783–84. Trailing, half-succulent perennial herb, rooting at the joints: lvs. lance-ovate, sessile, the leaf-sheath about ½ in. long and hairy at top and bottom and sometimes throughout its length; under surface of leaf red-purple; upper surface silvery white, suffused with purplish, the central part and the margins purple-striped: fls. about 2, rose-red, contained in two boat-shaped bracts, one of which is much smaller than the other. Mexico.—A very common greenhouse plant, much used for baskets and for covering the ground underneath benches. Commonly confused with *Tradescantia fluminensis*, Fig. 2785, and sometimes with *Commelina nudiflora*. See *Tradescantia*. The lvs. of *Z. pendula* seem never to be green. They vary somewhat in color. All forms are easily grown, and they propagate readily from pieces of stem. Var. **quadricolor,** Voss (*Tradescántia quadricolor* and *T. multicolor*, Hort.). Lvs. with metallic green undertone and striped with green, red and white. Handsome.

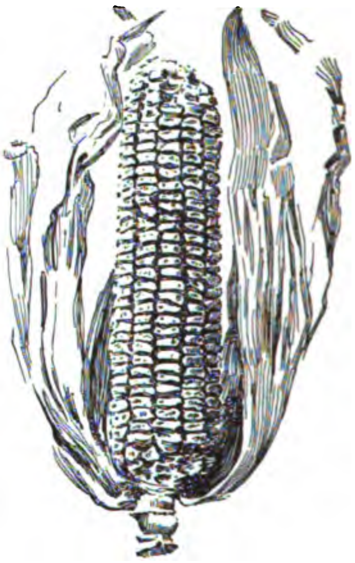
L. H. B.

2783. Flower of Zebrina pendula. Slightly enlarged.

2784. Zebrina pendula. (× ⅓.)

ZELKÒVA (after the vernacular name Zelkoua in Crete, or Selkwa in the Caucasus). Syn., *Abelicea. Urticàceæ.* Ornamental deciduous trees, with alternate, short-petioled, toothed leaves and insignificant flowers in axillary clusters or solitary, followed by small drupe-like fruits. *Z. acuminata* is hardy north and *Z. crenata* hardy as far north as Mass., at least in sheltered positions. The Zelkovas, particularly *Z. acuminata*, are handsome trees of graceful habit, much resembling a small-leaved elm tree. They seem not to be very particular as to soil and position. Prop. by seeds sown soon after ripening; also by layers and by grafting on Ulmus. Four species are known, natives of Crete, the Caucasus and E. Asia. They are allied to Celtis and Aphananthe and are chiefly distinguished by the connate sepals. From the elms, which they much resemble in foliage, they are easily distinguished by the drupe-like fruits.

Trees, sometimes shrubby, with penninerved, stipulate lvs.: fls. polygamous, the perfect ones solitary in the axils of the upper lvs., the staminate ones clustered in the axils of lower lvs. or bracts; calyx 4–5-lobed; sta-

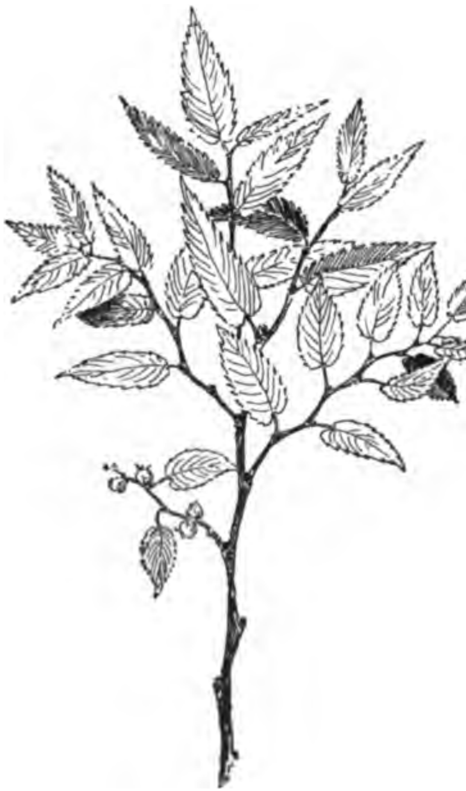

2782. Sweet Corn when mature and dry, showing the shrinking of the kernels (× ⅓).

mens 4–5; styles 2: fr. a 1-seeded drupe, usually broader than high, oblique, with the style eccentric. *Z. acuminata* is an important timber tree; the wood is very durable, and considered the best building material in Japan. The young wood is yellowish white in color; the old wood is dark brown and has a beautiful grain.

2785. Tradescantia fluminensis, often confounded with Zebrina (× ⅓). See Figs. 2539–41.

acuminàta, Planch. (*Z. Keàki*, Maxim. *Z. cuspidàta*, Hort. *Plánera acuminàta*, Lindl. *Plánera Japónica*, Miq.). Fig. 2786. Tree, attaining 100 ft., with broad, round-topped head: branches slender: lvs. short-stalked, ovate to oblong-ovate, acuminate, rounded or slightly cordate at the base, sharply and coarsely serrate, with acuminate teeth, pairs of veins about 10, somewhat rough above, almost glabrous, 1–2½ in. long, on fertile branches, 2–5 on sterile branches. April, May. Japan. G.F. 6:325. Gt. 37, pp. 22, 23.

crenàta, Spach (*Z. carpinifòlia*, C. Koch. *Plánera Richardi*, Michx. *Abelicea ulmoìdes*, Kuntze). Tree, attaining 80 ft., with slender branches forming an oval or oblong head: lvs. oval or ovate to oblong, slightly cordate or rounded at the base, coarsely toothed with obtusish teeth, with 6–8 pairs of veins, usually almost glabrous above at length, pubescent on the veins beneath, ¾–3 in. long. April, May. Caucasus. Gn. 24, p. 371.



2786. Zelkova acuminata (× ⅓).

Z. Japónica, Dipp., not Miq., is an imperfectly known species, supposed to be Japanese; it is distinguished from Z. crenata chiefly by the lvs. being somewhat smaller, more pubescent and rough above. Var. Verschaffelti, Dipp. (Ulmus Verschaffeltii, Hort.), has the lvs. deeply incisely dentate and broadly cuneate at base.

Alfred Rehder.

2787. Forced plant of Zenobia speciosa.

ZENÒBIA (after Zenobia, queen of Palmyra, who lived in the third century; a fanciful allusion to her having been chained as was Andromeda, whose name is commemorated by a closely allied genus). *Ericàceæ*. Ornamental low deciduous or half-evergreen shrub, with alternate, short-petioled, simple and white, campanulate, nodding flowers arranged in clusters along the last year's branches. Hardy as far north as Mass., and a very handsome shrub for borders of shrubberies, particularly when in bloom; the glaucous form is one of the most conspicuous shrubs with light-colored foliage. Zenobia is also recommended for forcing. It thrives best in a sandy or peaty soil. Prop. by seeds sown in spring and by layers; also by greenwood cuttings from forced plants. See, also, *Andromeda* and *Pieris* for culture. Monotypic genus native of N. America, closely allied to Andromeda and Pieris but chiefly distinguished by the open-campanulate fls. and 4-awned anthers; calyx 5-lobed, with short valvate lobes; corolla campanulate, as broad as high, obtusely 5-lobed; stamens 10; anthers with 4 slender awns: capsule depressed globose, obscurely 5-lobed, somewhat carinate at the dorsal sutures, dehiscent into 5 valves: seeds numerous, small, oval, angled.

speciòsa, Don (*Andrómeda speciòsu*, Michx. *A. cassinefòlia*, Vent.). Figs. 2787, 2788. Shrub, 2–4 ft. high, with upright or arching branches: quite glabrous: lvs. oval to oblong, obtuse or acutish, crenulate or finely serrulate, often covered more or less with glaucous bloom, 1–2 in. long: fls. on slender nodding pedicels, clustered and forming racemes 2–5 in. long; corolla white, ⅓ in. across. May, June. N. C. to Fla. B.M. 970. L.B.C. 6:551. Gn. 22, p. 271; 57, p. 185. G.C. III. 23, suppl. 28 May.—Var. **pulverulénta**, Michx. (*Andrómeda pulverulénta*, Bartr. *A. glaùca*, Hort. *A. cándida*, Hort.). Foliage covered with chalky-white or glaucous bloom. Gn. 24:420. B.M. 667. *A. dealbàta*, Lindl., is a form with similar foliage and the corolla 5-parted almost to the base. B.R. 12:1010. Var. **nítida**, Michx. (Var. *nùda*, Vent. Var. *viridis*, Hort.), has green foliage without bloom.

Alfred Rehder.

ZEPHYRÁNTHES (Greek, *flower of the west wind*). *Amaryllidàceæ*. Zephyr Flower. Fairy Lily. About three dozen species of bulbous plants native to the warmer parts of America. Unfortunately they are not quite hardy, but some of them are very satisfactory plants for window-gardens, resting somewhat in winter and blooming in summer under such treatment. They all have linear lvs. contemporaneous with the fls., and slender scapes about 6–9 in. high, crowned by solitary 6-lobed fls. of white, rose or yellow. The fls. are 1–3 in. across. Other generic characters: perianth regular, erect or suberect: corona none; anthers dorsifixed, versatile: ovules many, superposed: seeds black, flat.

The latest revision of Zephyranthes is found in Baker's Handbook of the Amaryllideæ, 1888, where the following subgenera are made:

SUBGENUS ZEPHYRANTHES PROPER. Flower erect; tube short; stamens inserted near its throat. (Eighteen species, including all described below except No. 11.)

2788. Zenobia speciosa (× ½). (See page 2007.)

SUBGENUS ZEPHYRITES. Flower slightly inclined; tube short; stamens inserted near its throat; style more declinate than in the other two subgenera. (Eleven species, including No. 11 below.)

SUBGENUS PYROLIRION. Flowers erect; tube longer, dilated in the upper half; stamens inserted at the middle of the perianth-tube. (Five species, none in cult.)

For the further separation of the species Baker uses the characters which appear in the key below, except the foliage characters and the color of the flowers. However, the genus may be readily separated into three sections based upon the color of the fls., and this arrangement is here used as being more convenient to the horticulturist. The seasons of bloom indicated below are those for localities where the plants will thrive outdoors the year round.

The Zephyr Lilies must be wintered in a place free from frost, and as the best kinds are natives of swampy places it is fair to presume that they will need more moisture during the resting period than the generality of bulbous plants. The four best species are: *Z. candida*, white, autumn; *Z. Atamasco*, white, spring; *Z. carinata*, rosy, summer; *Z. rosea*, autumn. All of these will probably survive the winter out of doors in our middle states if given a fair degree of protection.

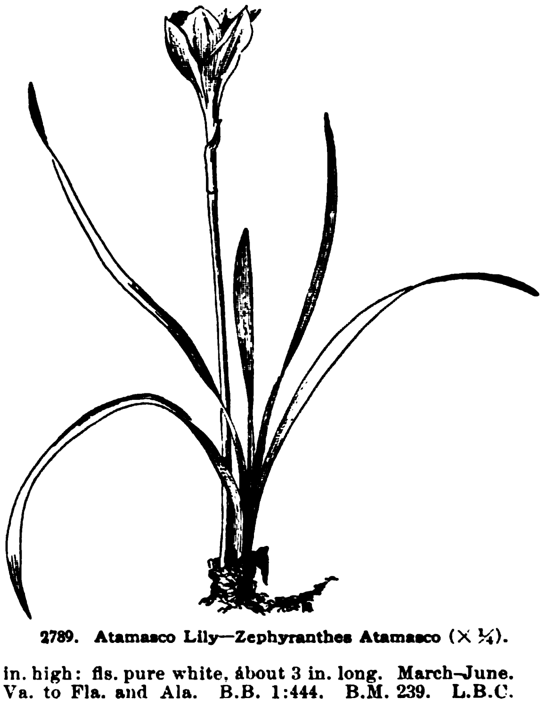
Z. candida deserves special notice. William Watson, of Kew, England, writes in Gn. 37, p. 174: "The most satisfactory of all is *Z. candida*. This species differs from all others known to us in several particulars, the chief being its hardiness and ease of management under ordinary cultivation in a sunny border out of doors. We have tried almost all the other species of Zephyranthes with this treatment, but they every one failed, whilst *Z. candida* flourished and multiplied rapidly, until we now have a border filled with it. This border is against the south wall of a greenhouse and it is always moist. The soil is ordinary loam, in which the bulbs were planted about 4 inches apart. They have each since become crowded tufts, their leaves completely hiding the soil. This border was as gay with the flowers of Zephyranthes last autumn as any border of crocuses in spring. On very sunny days the flowers opened quite flat, and glistened like snow in the sunshine. Another character which distinguishes this species from the others is its evergreen foliage." It is said that the river La Plata was so called (the name meaning "silver") because of the profusion of these white flowers on its shore.

INDEX.

Andersoni, 11.
Atamasco, 1.
candida, 5.
carinata, 6.
erubescens, 3.
grandiflora, 6.
Lindleyana, 7.
longifolia, 9.
rosea, 8.
Texana, 10.
Treatiæ, 2.
verecunda 4.

A. *Fls. white, often tinged rose outside.*
  B. *Stigma 3-lobed.*
    C. *Ovary stalked.*
      D. *Perianth 3 in. long.*
        E. *Lvs. channeled, bright green, shining, with acute margins*.......... 1. **Atamasco**
        EE. *Lvs. thick, semi-terete, deep green, not shining, with rounded margins*... 2. **Treatiæ**
      DD. *Perianth 2 in. long*......... 3. **erubescens**
    CC. *Ovary sessile*................. 4. **verecunda**
  BB. *Stigma capitate, obscurely 3-lobed*......................... 5. **candida**
AA. *Fls. bright rose-colored.*
  B. *Perianth 2½–3 in. long*......... 6. **carinata**
  BB. *Perianth 1½–2 in. long*......... 7. **Lindleyana**
  BBB. *Perianth about 1 in. long*....... 8. **rosea**
AAA. *Fls. yellow, often reddish outside.*
  B. *Style slightly declinate.*
    C. *Pedicel much shorter than spathe* .... 9. **longifolia**
    CC. *Pedicel much longer than spathe*......................10. **Texana**
  BB. *Style strongly declinate*.........11. **Andersoni**

1. **Atamásco**, Herb. (*Amaryllis Atamásco*, Linn.). ATAMASCO LILY. Fig. 2789, 2790. Most popular and largest of the spring-blooming white-fld. species; the commonest Zephyr Lily native to the U. S. Bulb short-necked, less than 1 in. thick: lvs. 4–6, linear: scape 6–12 in. high: fls. pure white, about 3 in. long. March–June. Va. to Fla. and Ala. B.B. 1:444. B.M. 239. L.B.C. 19:1899. Gn. 24, p. 199; 37, p. 155.



2789. Atamasco Lily—Zephyranthes Atamasco (× ¼).

2. **Treàtiæ**, Wats. Closely allied to *Z. Atamasco* and best distinguished by the lvs. as indicated in the

key. The perianth-segments are sometimes keeled with rose, but in both species the fls. turn pinkish with age. It is a Florida species, found in damper localities and blooming several weeks later than *Z. Atamasco*. V. 6:299. Gn. 33, p. 11.

3. **erubéscens,** Wats. (*Amarýllis erubéscens*, Horsford). Rare white-fld., August-blooming species supposed to be native to sandy plains of Texas, but perhaps from northern Mexico. Distinguished from the two preceding species by the larger, longer-necked bulb, shorter perianth and fls. strongly tinged with rose outside. Bulb over 1 in. thick; neck as long: spathe bifid above; tube equaling and closely embracing the pedicel (about 1 in. long).—Int. by Horsford 1889 and probably lost to cultivation.

4. **verecúnda,** Herb. Rare spring- and summer-blooming species, distinguished from other white-fld. species in cult. by the sessile ovary and long-necked bulb. Bulb 1 in. or less thick; neck 1–2 in. long: fls. 1½–2 in. long, greenish white, more or less tinged outside or keeled with rose. Highlands of central Mex. B. M. 2583.—Offered by Dutch dealers.

5. **cándida,** Herb. Fig. 2790. Most popular of white-fld. Zephyr Lilies, being distinguished from the others by its autumn-blooming habit and capitate stigma. Lvs. appearing in autumn with the fls. and lasting through the winter in favored localities, over 1 ft. long: fls. pure white or slightly tinged rose outside, 1½–2 in. long. Marshes of La Plata. Gn. 37:740. B. M. 2607. L. B. C. 15:1419.

6. **carinàta,** Herb. (*Z. grandiflòra*, Lindl.). Largest and choicest of the rosy-fld. species and said by Baker (1888) to be the commonest Zephyranthes in cultivation; however, the name *Z. rosea* is far commoner in American catalogues. It is a summer-blooming species with fls. 2½–4½ in. across, and about 3 in. long. Bulb 1 in. thick, short-necked: ovary stalked: stigma trifid. Jamaica, Cuba, Mexico, Guatemala. B.R. 11:902. Gn. 33:630 (erroneously as *Z. Atamasco*). I. H. 35:49. J.H. III. 29:339.

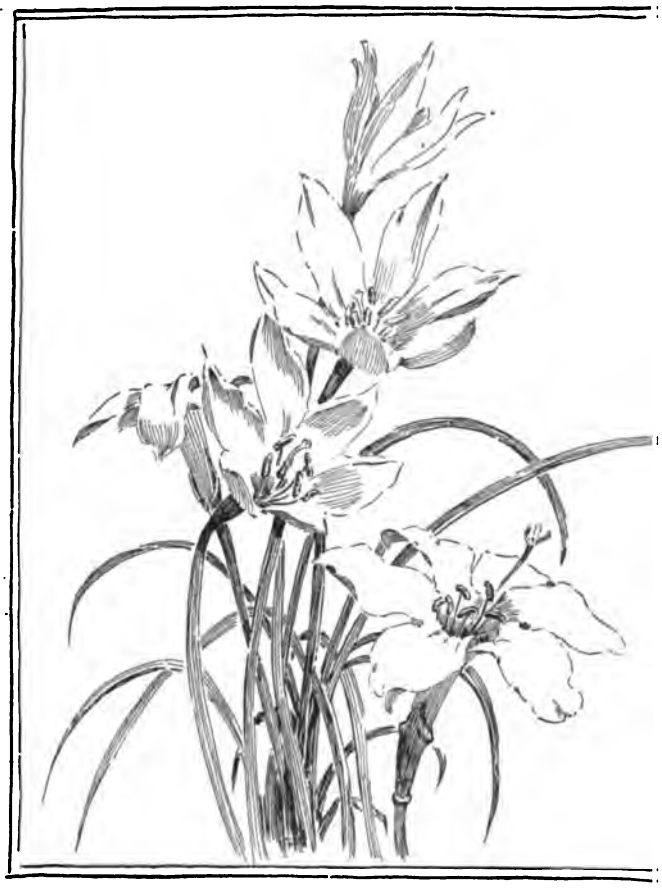
7. **Lindleyàna,** Herb. Rare summer-blooming rose-colored species from the mountains of Mexico, inferior to *Z. carinata* for general culture. Bulb globose, ¾ in. thick; neck short: fls. 1½–2 in. long: ovary stalked; stigma 3-fid; spathe 3-fid only at tip.—Once offered by Lovett, of Little Silver, N. J.

8. **ròsea,** Lindl. Autumn-blooming rosy-fld. species, with much smaller fls. than *Z. carinata* but, according to American catalogues, the most popular rosy-fld. species. The fls. are only about an inch long and 1½ in. broad: bulb globose, ¾ in. thick: neck scarcely any: spathe 2-fid at tip only: ovary stalked: stigma 3-fid. Oct. Cuba. B.M. 2537. B.R. 10:821. Gn. 12, p. 84 (col. plate).—Trade plants of *Z. rosea* should be compared with *Z. carinata*.

9. **longifòlia,** Hemsley. Summer-blooming, yellow-fld. species. Distinguished from the next by characters of pedicel and spathe. Bulb ovoid; neck 1½–2 in. long; spathe tubular in the lower half: pedicel much shorter than spathe: fls. yellow, coppery outside, ¾–1 in. long. New Mex. Int. by Horsford, 1889, and probably lost to cult.

10. **Texàna,** Herb. Yellow-fld. Texan species. Bulb globose; neck 1–1½ in. long: spathe bifid only at the tip: pedicel much longer than the spathe: fls. yel coppery outside, 1 in. long, 1½ in. across. B.M. (*Habranthus Andersoni*, var. *Texanus*).

11. **Andersoni,** Baker. Yellow-fld. S. American cies of uncertain blooming time. The fls. are usu flushed and veined with red outside and there is a with copper-colored fls., inside and out. Bulb ov short-necked: fls. 1–1½ in. long, 2 in. across. Mc video, Buenos Ayres. L.B.C. 17:1677 and B.R. 16: (both as *Habranthus Andersoni*).—Apparently the representative in cultivation of its subgenus, whic characterized by strongly declinate stamens.



2790. Zephyranthes candida above and Z. Atamasco below (× ⅔).

Z. álba, floribúnda and *sulphùrea* of the American t seem to be unknown to botanists. They can probably b ferred to some of the above species. W. M

ZEPHYR FLOWER. *Zephyranthes.*

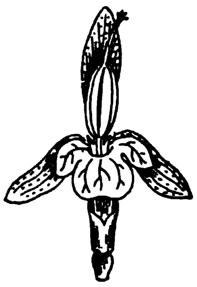
ZÍNGIBER (name ultimately derived from a Sans word meaning *horn-shaped;* probably referring to Ginger root). *Scitamináceæ.* GINGER. The Gin plant is a small reed-like plant about 2 ft. high, cultivated in greenhouses, with tuberous rhizom aromatic leaves and dense cone-like clusters of bra The flowers, however, are very rarely produced in tivation, and Roxburgh wrote that he never saw seeds. The plant is supposed to be native to In and China, but, like many other tropical plants the highest economic importance, its nativity is certain. Some idea of the importance of Ginger to world may be gained by the fact that in 1884 G

Britain imported 5,600,000 pounds of Ginger valued at $620,000. Medicinal Ginger is prepared from the dried "root;" condimental Ginger from the green. Candied Ginger is made from carefully selected, succulent young rhizomes which are washed and peeled and then preserved in jars of syrup. Housewives often preserve their own Ginger; it is important to have the hands protected while scraping the roots or they will "burn" for days. Ginger probably could be cultivated commercially in southern Florida and California. In Florida it thrives in rich soil and partial shade, and the roots can be dug and used at any time. The plant is cultivated commercially even in localities where it is necessary to lift the roots and store them over the cool season, as in the lower Himalayas. In the West Indies Ginger may be cultivated up to an altitude of 3,500 feet.

2791. Zingiber officinale

Zingibers are occasionally cultivated as stove decorative plants. The shoots having a reed-like appearance, they may often be used to good advantage in arranging plants for artistic effects. They are of the easiest culture. Propagation is effected by division of the rhizomes in spring. These should be potted in fibrous loam to which a third of well-decomposed cow or sheep manure has been added. Water should be given sparingly until the shoots have well developed, when they should have an abundance. They are also benefited by an occasional watering with weak liquid manure water. Towards the end of summer the shoots will begin to mature, when the water supply should be diminished, and as soon as the plants are ripened off the pots may be stored either under the greenhouse stages or in some other convenient place, where they should be kept almost dry for the winter.

Zingiber may be taken as the typical genus of the singular family Scitaminaceæ, with its 36 genera and 450 species. Bentham and Hooker state that it is an extremely natural group, well marked in leaf as well as flower, and not connected with any other family by a single intermediate genus. The distinguishing feature of the family largely resides in the stamens. Sometimes there are 5 stamens and a sixth imperfect one; sometimes there is only one perfect stamen and all the staminodes are petal-like. The anthers are sometimes 2-celled, sometimes composed of one cell borne on the margin of the connective. In Zingiber and others the connective is produced into a long spur. Generic characters: rhizome horizontal, tuberous: lvs. oblong-lanceolate, clasping the stem by their long sheaths: spikes usually radical, rarely lateral or terminal on the leafy stem: calyx cylindric, shortly 3-lobed; corolla-segments lanceolate, upper concave; lateral staminodes none or adnate to the lip; anther-cells contiguous; crest narrow, as long as the cells. Thirty species, native to Old World tropics. Compare *Canna* and *Musa*


2792. Flower of the Ginger plant (× ½).

officinàle, Rosc. GINGER. Figs. 2791-93. Rootstock biennial, bearing many sessile tubers: stem 3-4 ft. high in tropics: lvs. 6-13, in. long, lanceolate, glabrous beneath: spike 2-3 x 1 in., oblong, produced from the rootstock on peduncles ½-1 ft. long, with sheathing, scarious bracts about 1 in. long: corolla-segments under 1 in. long; stamen dark purple. Gn. 26, p. 284.

Z. corallinum, Hance, is a Chinese species offered by Reasoner Bros. in 1889 but probably not in cultivation now. It is not described in any work to which the undersigned have access.—*Z. Zerumbet*, Roscoe, is cult. and escaped in Porto Rico. It has broadly lanceolate lvs. and large pale yellow fls.; about 4 feet. B.M. 2000.

E. J. CANNING and W. M.

2793. Commercial roots of Ginger, as seen in the stores (× ½).

ZÍNNIA (Johann Gottfried Zinn, 1727-1759, professor of botany at Göttingen). *Compósitæ*. YOUTH-AND-OLD-AGE. Plate L. The familiar Zinnias, Figs. 2794-96, are hardy annual plants, growing a foot or more high and covered from July until the first hard frost with double flowers 2 in. or more across. At least fifteen well-marked colors are commonly seen in Zinnias,—white, sulfur, yellow, golden yellow, orange, scarlet-orange, scarlet, flesh-color, lilac, rose, magenta, crimson, violet, purple and dark purple. There are also variegated forms, but the solid colors are most popular. The Zinnia is rich in shades of purple and orange, but lacks the charming blue and pink of the China aster and is poor in reds

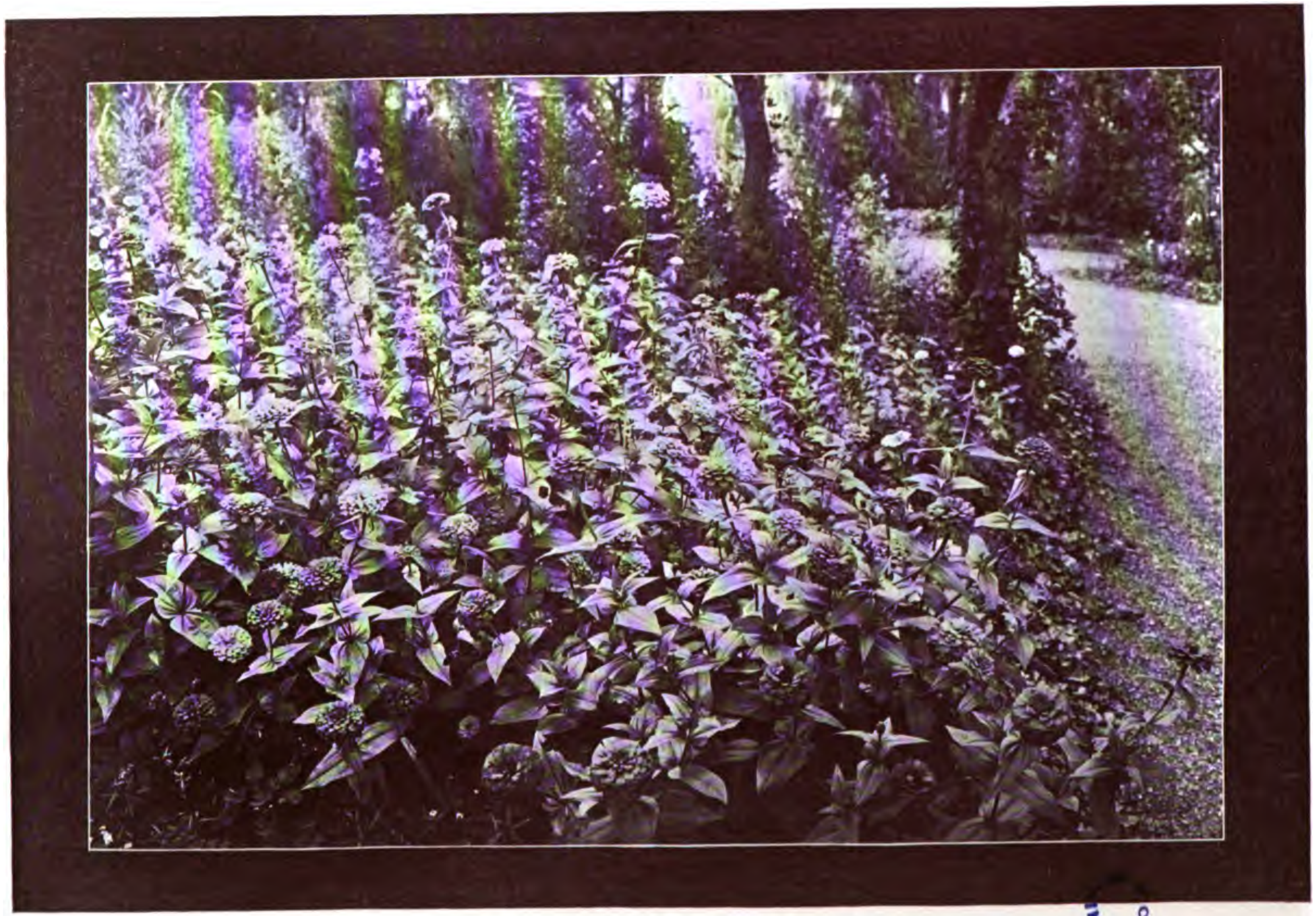


Plate L. The modern commercial race of double-flowered Zinnias.

compared with the dahlia. Among garden composites its only rivals in point of color range are the chrysanthemum, dahlia, China aster and cineraria. Among garden annuals in general the Zinnia ranks with the most useful kinds, and many persons would place it among the twelve most popular of annual flowers. Zinnias are formal flowers, rather stiff in habit, with exceptional depth of flower, and in technical perfection a little short of the dahlia: the rays are rather rigid and overlap one another with somewhat monotonous precision, and the colors are metallic as compared with the soft hues of the China aster.

Historical Sketch.—The Zinnia (*Z. elegans*), with its great range of color and perfection of form, is now so much a matter of course that the present generation is surprised to learn that it is one of the most recent of "florists' flowers." A double Zinnia probably was not seen in America before the Civil War. In the early sixties, the Zinnia was a sensation of the floral world; in the seventies it ceased to be fashionable and as early as 1882 it was spoken of as an "old-fashioned" flower. Its course was run in twenty years.

The single form of the Zinnia is now cultivated only for its scientific or amateur interest. Single Zinnias are not offered by tradesmen and occur only as degenerates from the double form. The first double forms appeared in 1858 at the nursery of M. Grazau, at Bagnères, France, amongst a number of plants raised from seed received from the West Indies. The double forms were introduced to the public by Vilmorin in 1860. Probably the earliest colored plate of double Zinnias is that in Flore des Serres published toward the end of 1860. This shows that the first double forms were much flatter and rougher (i.e., less regular) than to-day and often exhibited some remnant of the disk. The fixation of bright, distinct colors proceeded rapidly, but the purification of the white seems to have been a slow process. The depth of the flower has increased from an inch or so in the earliest double forms to an average of 2 inches for first-class specimens, with a maximum of 4 inches in the robust type. The rays are now arranged in 15 or more series, as against 5 or 6 in the first double forms. The first double forms are shown as 2½–3 in. across, which is a good average for to-day.

The accepted type of Zinnia flower is essentially that of Fig. 2795, but the florist's ideal represents a much deeper flower of absolute fulness and regularity. Of recent years several minor variations have appeared. Tubular forms are known to the trade as "*Z. tagetiflora flore pleno.*" The curled and crested forms, introduced in the nineties, represent the reaction against formal flowers in general. Much care has been bestowed in perfecting the habit of Zinnias, and there are five well-marked degrees of height, which for purposes of explanation and general convenience may be considered as three,—tall, medium and dwarf.

I. TALL ZINNIAS are ordinarily 20 to 30 inches high. This size and the next smaller size are the favorites for general purposes. The tall kinds are available in 12–16 colors. A robust race, which attains 28 to 40 inches under perfect conditions, is known to the trade as *Z. elegans robusta grandiflora plenissima*. It is also known as the Giant or Mammoth Strain. This strain was developed after many years by Herr C. Lorenz and was introduced in 1886. A maximum diameter of 6 inches is recorded for flowers of this strain. In G.C. II. 26:461 is shown a flower measuring 4 x 4 in., with about 18 series of rays, the latter being so numerous and crowded that the flower is less regular than the common type. A specimen Zinnia plant 3 ft. high is attained in the North only by starting the seed early and giving perfect culture.

II. MEDIUM-SIZED ZINNIAS range from 12–20 inches in height. They are available in about 8 colors. Here belong most of the forms known to trade catalogues as *pumila*, *nana* and *compacta*.

III. DWARF ZINNIAS range from 3–12 inches in height and are of two sub-types, the pompons and the Tom Thumbs. The pompons, or "Liliputians," are taller growing and smaller flowered, generally about 9 inches high, with a profusion of flowers about 2 inches across. The Tom Thumb type represents the largest possible flower on the smallest possible plant. Both types are available in several colors, not all of which are yet fixed in the seed.

Zinnia Haageana is second in importance to *Z. elegans*. The single form was introduced to cultivation about 1861 and the double about 1871. It is dwarfer than most Zinnias, and has smaller flowers, with a color range restricted to shades of orange. It is distinct and pretty but less showy than the common Zinnias. The first race of hybrids between Haageana and elegans appeared in 1876 under the name of *Z. Darwini*. This group is said to resemble *Z. elegans* in size and color of fls., and to recede from *Z. elegans* in habit, being more branched and forming a broader and thicker bush. However, this race has never been adequately described and it is little known in America to-day. Several varieties of the Darwin class are figured in The Florist and Pomologist 1876, pp. 28, 29. Some recent hybrids of Haageana and elegans not yet introduced are said to be full of promise.

2794. Single Zinnia (× ½).

Culture of Zinnias.—Zinnias are of the easiest culture, thriving in any deep, rich soil, whether loamy or sandy. The seeds may be sown about May 1, or whenever the soil is in fit condition for hardy annuals. Such treatment will give flowers from the first of July until frost. The young plants should be thinned so as to stand a foot or two apart, depending on whether they are of medium or tall-growing habit. By midsummer the foliage should obscure the ground. For the very best results the seed may be started indoors about April 1, and the seedlings transplanted once or twice before being placed outdoors in permanent quarters. Such pains are, however, not worth while for most people. In 1801 it was considered the regular thing to start the single Zinnias indoors, but this bother is no longer necessary. Dwarf varieties should be set 14–16 in. apart: taller kinds 2 ft. each way.

Zinnias have two kinds of seeds, triangular and heart-shaped. The triangular seeds are long, narrow, thick and ridged. The heart-shaped seeds are short, broad and flat. Some growers believe that the heart-shaped seeds tend to produce single flowers; others hold the opposite opinion.

2795. Double Zinnias (× ½).

Generic Description.—Zinnia is a genus of 16 species of annual, perennial and subshrubby plants, mostly Mexican but ranging from Texas and even Colorado to Chile. They have opposite, mostly entire lvs. and terminal heads of fls. which are peduncled or sessile. Rays pistillate, fertile: disk yellow or purple, its fls. hermaphrodite, fertile: involucre ovate-cylindric or campanulate, the scales in 3 to many series, broad, obtuse or rounded, more or less colored: akenes laterally compressed, 2-toothed at the summit and frequently 1-awned from the inner angle, rarely 2-awned. Latest botanical revision by Robinson and Greenman in Proc. Am. Acad. Arts Sci. 32:14 (1897). There is a good summary of cultivated Zinnias by Voss in Vilmorin's Blumengärtneri. Illustrated historical sketch in Gn. 48, pp. 464, 465.

A. *Plant annual.*
  B. *Akenes of the disk fls. short and broad, obovate, 2–2½ lines long.*
    C. *Colors various: lvs. clasping, cordate-ovate or elliptic* .... **elegans**
    CC. *Color orange: lvs. sessile, narrower, lanceolate* .... **Haageana**
  BB. *Akenes longer, narrower, oblong, 3–4 lines long.*
    C. *Color of rays yellow: disk yellow.* **pauciflora**
    CC. *Color of rays red or purple.*
      D. *Rays suberect or scarcely spreading: disk yellow* .... **multiflora**
      DD. *Rays revolute; disk dark-colored.* **tenuiflora**
AA. *Plant perennial* .... **grandiflora**

élegans, Jacq. YOUTH-AND-OLD-AGE. The common species from which most of the garden Zinnias are derived. Figs. 2794–96. Erect annual, a foot or more high, but varying from 3 in. to 3 ft.: lvs. ovate or elliptic, clasping, about 1 in. wide: rays reflexed, originally purple or lilac, but now of nearly every color except blue and green: disk originally yellow or orange, but nearly or quite absent in the common double forms: fls. 2–5 in. across. July to Oct. Mexico.—Single forms ill. in B.M. 527, P.M. 1:223 and B.R. 15:1294 (the last two as *Z. violacea*). Double forms, F.S. 13:1394, R.H. 1861:251; 1864:331. Pompons in Gn. 48, p. 464 (Liliput); 30:562 (deceptive as to size). R.B. 20, p. 152.

Haageàna, Regel (*Z. Mexicàna*, Hort.). Fig. 2797. Distinguished from *Z. elegans* by the orange-colored fls., which are generally smaller; also the plant is dwarfer, as a rule, and the leaves are merely sessile, not clasping. Tropical America. Single forms, Gn. 30, p. 270; 48, p. 464. Double, Gn. 30, p. 271; 48, p. 301. F. 1871, p. 229. A.G. 1892:218.—This is considered by Robinson and Greenman as a horticultural species not certainly distinguishable from *Z. angustifolia* in spite of its broader leaves.

pauciflòra, Linn. An erect annual, with yellow heads about 1 in. across, with rather broad, spreading rays. Plant hirsute, with spreading hairs;

2796. Youth-and-old-age. Common garden Zinnias, single and semi-double.

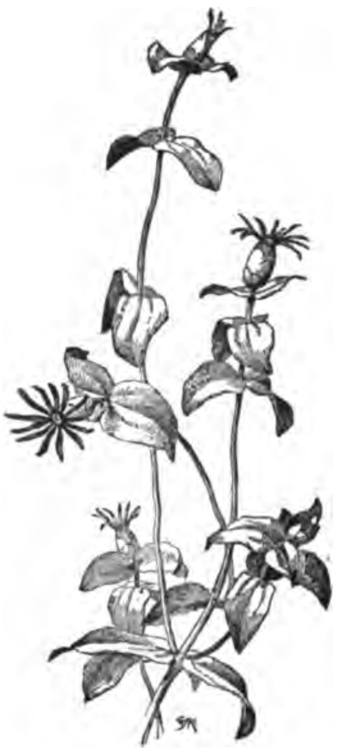
somewhat corymbosely branched above: peduncles at maturity enlarged upwards and hollow. Mexico, Peruvian Andes.

multiflòra, Linn. This and the next are included by most writers in *Z. pauciflora*, but *Z. multiflora* may be distinguished from *Z. pauciflora* by the pubescence of the stem being much finer, appressed or rarely spreading, and the rays red or purple, mostly narrow and suberect or scarcely spreading. B. M. 149.

tenuiflòra, Jacq. Fig. 2798. Very distinct by reason of its revolute, linear rays which are cardinal-red in color. It has a dainty flower about 1 in. across hardly comparable with the showy *Z. elegans*. This species has been cult. in America but seems to be no longer advertised here. It is referred to *Z. pauciflora* by most writers, and to *Z. multiflora* by Robinson and Greenman. B.M. 555. A. G. 1890:243.

grandiflòra, Nutt. Hardy, low-growing, Colorado perennial, with woody root, shrubby base, linear lvs. and sulfur-yellow rays which are very broad, almost round in outline. Lvs. less than 1 in. long and 3-nerved. Colo., New Mex., Ariz., Mex. Int. 1900 by D. M. Andrews.

W. M.



2798. Zinnia tenuiflora.

The rays are typically more revolute than they are shown in this figure.

ZIT-KWA. *Benincasa cerifera.*

ZIZÀNIA (an old Greek name). *Gramineæ.* A single species of annual swamp grass found in northern N. A. and northern Asia. Spikelets 1-fld., monœcious, in large, terminal panicles, the pistillate upper portion narrow and appressed, the staminate lower portion spreading: pistillate spikelets long awned. The plant is a stately and graceful grass, deserving to be better known.

aquática, Linn. Indian Rice. Water Oats. Wild Rice. Culms tall, as much as 9 ft.: lvs. broad and flat. Recommended for borders of lakes and ponds. The grain is excellent for fish and water fowl. Wild Rice lakes and ponds are favorite resorts of sportsmen in the fall. Before sowing, put the seeds in coarse cotton bags and sink them in water for twenty-four hours. Sow in water from 6 in. to 5 ft. deep, with soft mud bottom, or on low marshy places which are covered with water the year round. In running water, sow as much out of the current as possible. Sportsmen are not generally aware that seed can be obtained in large quantities and at a reasonable price from seedsmen. Wild Rice is very desirable for aquatic gardens, being one of the handsomest of tall hardy grasses for the margins of ponds.

A. S. Hitchcock.

ZÍZIA (I. B. Ziz, Rhenish botanist). *Umbelliferæ.* A genus of three species of hardy perennial North American herbs 1-2½ ft. high, with ternate or ternately compound leaves and compound umbels of yellow flowers. The genus has no horticultural status, the two following species being advertised only by collectors of native plants. For full account, see Britton and Brown's Illustrated Flora, Coulter and Rose's Monograph of the North American Umbelliferæ, Contrib. U. S. Nat. Herb. 7:90 (1900), and Manuals. Zizias are mostly referred to Thaspium by previous botanists, but the authors cited above retain it as a separate genus mainly on account of the wingless fruit.

A. *Rays of umbels 9-25, stout, ascending.*

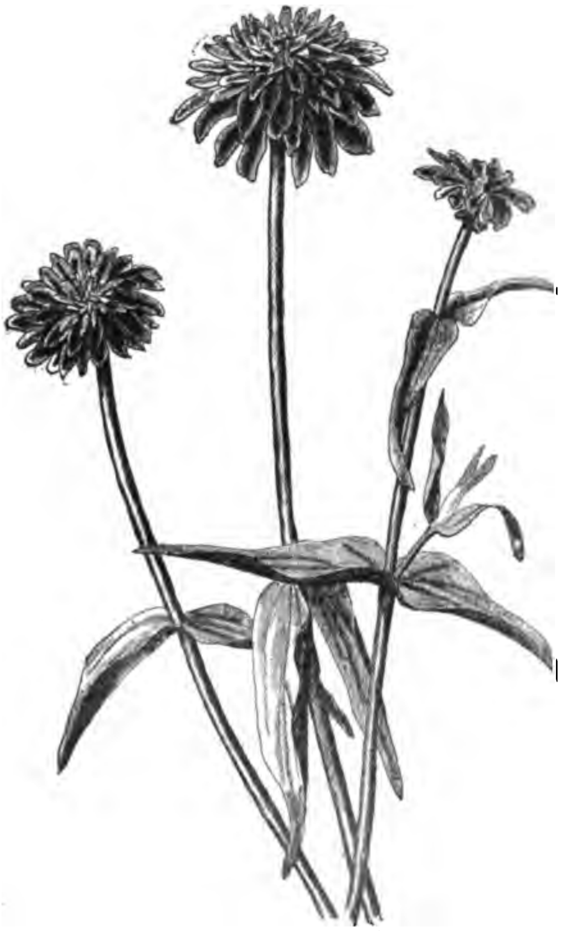
aùrea, Koch. Early or Golden Meadow Parsnip. Height 1-2½ ft.: basal and lower lvs. 2-3-ternately compound: upper lvs. ternate: fr. oblong, 2 x 1½ lines. April-June. Fields, meadows and swamps, New Bruns. and S. Dak. to Fla. and Tex. B.B. 2:534.

AA. *Rays of umbels 2-12, slender, diverging.*

Bébbii, Britton. Distinguished from *Z. aurea* by the rays and by the fr., which is oval or broader, 1-1¼ lines. May. Mountain woods, Va. and W. Va. to N. C. and Ga. B.B. 2:534.

W. M.

ZÍZYPHUS (from Zizouf, the Arabian name of *Z. Lotus*). *Rhamnàceæ.* Jujube. Deciduous or evergreen shrubs, or sometimes trees usually with prickly branches, alternate, short-petioled, 3-5-nerved, entire or serrate lvs. and small greenish or whitish flowers in axillary cymes followed by drupe-like sometimes edible fruits. They are not much cultivated in this country



2797. Zinnia Haageana (× ⅔).

and none of the species is hardy north; the hardiest seems to be *Z. vulgaris*, but it is tender north of Washington, D. C. Most kinds have handsome foliage and are well adapted for planting in shrubberies in the southern states and California. They seem to thrive in any well-drained soil. Prop. by seeds, by greenwood cuttings under glass and by root-cuttings. A genus of about 40 species distributed through the tropical and subtropical regions of both hemispheres, allied to *Paliurus*, but chiefly distinguished by the drupe-like fruit. Shrubs with slender often procumbent branches, or trees; stipules mostly transformed into spines, often only one stipule spiny or one a straight and the other a hooked spine: fls. 5-merous: ovary 2–4, usually 2-loculed; style usually 2 parted: fr. a subglobose to oblong drupe. The fruit of *Z. Jujuba*, *vulgaris* and *Z. Lotus* are edible and the first named is much cult. in China.

Jujùba, Lam. Tree, 30–50 ft. high: branches usually prickly; young branchlets, petioles and inflorescence densely rusty tomentose: lvs. broadly oval or ovate to oblong, obtuse, sometimes emarginate serrate or entire, dark green and glabrous above, tawny or nearly white tomentose beneath, 1–3 in. long: fls. in short-stalked many-fld. axillary cymes: fr. subglobose to oblong, orange-red, ½–¾ in. long, on a stalk about half its length. March–June. S. Asia, Africa, Australia. Gn. 13, p. 194.

sativa, Gärtn. (*Z. vulgàris*, Lam.). COMMON JUJUBE. Shrub or small tree, attaining 30 ft.: prickly or unarmed: glabrous branchlets often fascicled, slender and having frequently the appearance of pinnate lvs.: lvs. ovate to ovate-lanceolate, acute or obtuse, oblique at the base, sometimes emarginate, serrulate, glabrous, ¾–2 in. long: fls. fascicled, in axillary cymes: fr. ovoid to oblong, dark red or almost black, ½–¾ in. long, short-stalked. March–June. S. Eu., S. and E. Asia; naturalized in Ala. A.G. 1891:79 (as var. *inermis*). The Jujube is somewhat planted in Florida and California, although it yet has no commercial rating as a fruit plant. According to Wickson, it was introduced into California in 1876 by G. P. Rixford, and is "fruiting regularly and freely in several parts of the state." The fruits or berries are ripe in November and December, and the plant begins to bear at three years from planting. The Jujube fruit is used in confectionery.

Z. Lòtus, Lam. Prickly shrub, 3–4 ft. high: lvs. ovate-oblong, crenulate, glabrous: fls. in few-fld. axillary cymes: fr. subglobose, yellow. S. Eu., N. Afr.—*Z. Paliùrus*, Willd.=Paliurus Spina-Christi.—*Z. Spina-Christi*, Willd. Small prickly tree: lvs. oval to oblong, crenulate, glabrous or pubescent on the veins beneath: fls. in axillary clusters; pedicels tomentose: fr. ovoid-globose, red. N. Afr. W. Asia. This species is supposed by some to have furnished Christ's crown of thorns; see also Paliurus Spina-Christi.

Z. Párryi, Torr. Belongs to the genus Condalia, which is easily distinguished by not having spiny stipules but the branchlets transformed into slender thorns and by its entire, usually penninerved lvs.—*Z. Parryi*, Weberb., is a much branched, glabrous thorny shrub, 4–15 ft. high: lvs. elliptic to obovate, obtuse, cuneate at the base, ⅓–½ in. long: fls. slender pediceled, in sessile clusters: fr. ovoid, ½ in. long S. Calif. This plant was once offered by a collector of native plants, but it is probably not in the trade now. ALFRED REHDER.

ZYGADÈNUS (Greek, *yoke* and *gland*, some of the species having two glands in the base of the perianth). *Liliàceæ*. As outlined by Bentham & Hooker, the genus has 12 species, one of which is Siberian and the remainder North American and Mexican. This disposition includes Amianthium in Zygadenus, but most authors do not unite the two. They are smooth, rhizomatous or bulbous plants, with simple erect stems bearing a raceme or panicle of white, yellowish or greenish flowers; lvs. mostly crowded at the base of the flower-stem, long-linear. The fls. are perfect or polygamous, the segments many-nerved and often adnate to the base of the ovary, the parts withering and persistent; stamens 6; capsule 3-loculed, the locules in fruit separate at the top or for their entire length.

The species of Zygadenus are little known in cultivation. They are sometimes recommended for the wild garden, where they thrive in wet or boggy places. Increased by division; also rarely by seeds. Some of the species have poisonous bulbs, rhizomes and foliage. Monographed by Watson, Proc. Amer. Acad. Arts & Sci. 14:278 (1879).

A. *Locules of the capsule dehiscing to the base: stamens free from perianth-segments: glands usually 1 or 2 in the base of the perianth. Zygadenus proper.*

B. *Glands large, covering nearly the whole base of the perianth segments: bulb tunicated.*

C. *Fls. usually perfect, rather large.*

élegans, Pursh (*Z. glaùcus*, Nutt. *Helònias glabérrima*, Ker.). Three ft. or less tall, the lvs. ½in. or less broad and very glaucous: bracts purplish: fls. greenish, in simple or sparingly branched racemes, the segments broad and less than ⅓in. long, coherent to the ovary, the fl. opening about ½in. across. Across the continent from New Brunswick and south to New Mexico. B.M. 1680. B.R. 24:67.

Frèmontii, Torr. Lvs. an inch or less broad, less glaucous than the above: bracts green: fls. usually larger, rotate, the segments free from the ovary. California, from San Diego north, in the Coast Range.—One of the "Soap plants." Said to be the best of the genus for cultivation.

Núttallii, Gray. Lvs. from ¼–¾ in. wide, scarcely glaucous, light green: bracts scarious: fls. ⅓ in. across, in a simple or branched raceme, the segments free from the ovary. Kans. to Colo. and Texas.

CC. *Fls. polygamous, small.*

venenòsus, Wats. Slender, 2 ft. or less tall: lvs. very narrow (¼ in. or less), scabrous, not glaucous, the stem-lvs. not sheathing: bracts narrow, scarious: fls. in a short simple raceme, the perianth free from the ovary, the segments ¼ in. or less long, triangular-ovate to elliptic, short-clawed. S. Dakota to California.—Bulb poisonous.

paniculàtus, Wats. Usually stouter, the lvs. broader and sheathing: raceme compound: perianth-segments deltoid, acute, short-clawed. Saskatchewan to Calif.—Bulb poisonous.

BB. *Glands very obscure: bulb somewhat fibrous, narrow.*

leimanthoides, Gray. Stem slender and leafy, 4 ft. or less tall: lvs. ⅛ in. or less wide, green on both sides: racemes panicled: fls. about ⅛ in. across, the segments oblong, not clawed. N. J. to Ga.

AA. *Locules dehiscing only above the middle: stamens inserted on the perianth-segments: glands none: bulbous.*

muscitóxicum, Regel (*Helònias læta*, Ker. *Amiánthium muscætóxicum*, Gray. *Chrospérma muscætóxicum*, Kuntze). FLY-POISON. Slender, 4 ft. or less tall: lvs. rather short, the basal ones varying from ⅙ in. to over 1 in. broad, not glaucous: racemes simple: fls. about ⅓ in. across, the segments ovate-oblong and obtuse. New York to Fla. and Ark. B.M. 803, 1540. L.B.C. 10:998. Gn. 57, p. 160.—Bulb and herbage poisonous. A fly poison has been made from the bulb. L.H.B.

ZÝGIA. See *Albizzia*.

ZYGOPÉTALUM (name referring to the united flower parts). *Orchidàceæ*. Plants with numerous distichous lvs. sheathing a short stem which usually becomes thickened into a pseudobulb: lvs. membranaceous, venose or plicate: fls. solitary or in racemes, showy: sepals and petals nearly alike in form and color, often united to each other at the base, the lateral sepals forming a mentum with the foot of the column; labellum with the lateral lobes scarcely prominent, middle lobe broad and plane, spreading, or recurved at the apex, with a prominent fleshy crest on the disc: column incurved, wingless or with small wings; pollinia 4, not appendiculate. Includes *Bollea*, *Huntleya*, *Warczewiczella* and *Batemannia*, which are often separated as distinct genera. HEINRICH HASSELBRING.

Zygopetalum is a genus of mostly epiphytal orchids, of easy culture. The *Z. Mackaii* group grow well under pot culture. One or two species with creeping rhizomes, like *Z. maxillare*, thrive best on sections of tree fern, osmunda rhizome or in baskets. A good compost consists of equal parts of chopped sod, peat fiber and sphagnum moss, well mixed and interspersed with pieces of rough charcoal, about one-half of the pot space being devoted to clean drainage material. After distributing the roots, the compost should be worked in carefully but not too firmly about them, leaving the base of the plant even with, or just above, the rim of the pot. Repotting should be done when the plants show new root action. The temperature should range about 60° F. by night and 65° to 70° by day in winter, and in summer as low as possible, with free ventilation during inclement weather. A cool, light location in the cattleya department is favorable. The compost should be kept in a moist condition at all times. The plants are propagated by cutting through the rhizome between the old pseudobulbs at a good eye, potting up the parts and removing them to a rather higher temperature until they start into new growth.

The Batemannia, Pescatoria and Warczewiczella groups are very similar in habit of growth, and all thrive well in orchid baskets suspended from the roof of the odontoglossum or coolhouse, in a compost consisting almost entirely of chopped live sphagnum, freely interspersed with rough pieces of charcoal. Autumn is the best time to rebasket the plants, as they suffer during the warm weather if disturbed at the roots during spring. They need a shaded location, a moist atmosphere and a liberal supply of water at the roots at all seasons. Never allow them to remain dry, as they have no resting season.

The Bollea group is closely allied and requires the same general culture but needs 5° F. higher temperature during the winter season.

The Promenæa group comprises a few small-growing species, all good subjects for the cool department. They grow best suspended from the roof in small baskets or perforated pans in a mixture of peat fiber and chopped sphagnum with a liberal supply of water and good drainage.

R. M. GREY.

INDEX.

Burtii, 12.
cœleste, 9.
cæruleum, 5.
crinitum, 5.
discolor, 13.
Gautieri, 3.
intermedium, 6.
Lalindei, 11.
Mackaii, 2.
maxillare, 4.
Patini, 10.
rostratum, 1.
Sedeni, 7.
violaceum, 8
Wendlandi, 14.

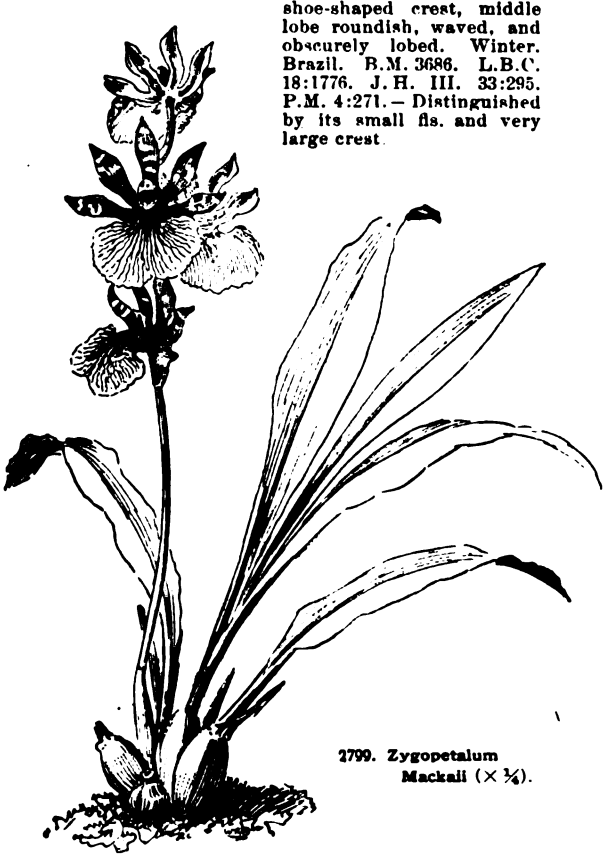
A. *Scape tall, several-fld.*
  B. *Anther long-rostrate* .... 1. **rostratum**
  BB. *Anther not rostrate* ....
    C. *Petals spotted or blotched.*
      D. *Labellum glabrous* .... 2. **Mackaii**
      3. **Gautieri**
      4. **maxillare**
      DD. *Labellum pubescent* .... 5. **crinitum**
      6. **intermedium**
    CC. *Petals uniformly colored* ...... 7. **Sedeni**
AA. *Scape shorter than the lvs., 1-fld.*
  B. *Column hood-like, arching over the crest.*
    C. *Fls. deep violet* .... 8. **violaceum**
    CC. *Fls. violet-purple* .... 9. **cœleste**
    CCC. *Fls. rose-colored* ....10. **Patini**
    11. **Lalindei**
  BB. *Column not hood-like.*
    C. *Fls. brown, spotted* ....12. **Burtii**
    CC. *Fls. white or greenish white*...13. **discolor**
    14. **Wendlandi**

1. **rostràtum**, Hook. Pseudobulbs oblong, compressed: lvs. lanceolate, 5 in. long: scapes 4 in. long, bearing 1–3 fls.: sepals and petals linear-lanceolate, greenish brown, wavy, 2–3 in. long; labellum about as long as the petals, subrotund, with reflexed margins, pure white with few radiating lines near the base: column wings rounded, sharply serrate on the upper margin: anther with a long beak surmounting the column. May, June, Oct. Guiana. B.M. 2819. J.H. III. 28:7. A.F. 6:633.

2. **Máckaii**, Hook. Fig. 2799. Pseudobulbs large, ovate: lvs. many, linear-lanceolate, 1 ft. long: scape 18 in. long, bearing 5 or 6 large fls.: sepals and petals dingy yellowish green, with blotches of purple on the inside, lanceolate, acute, erect, spreading, all united toward the base; labellum large, rounded, emarginate, white with radiating vein-like deep blue lines, glabrous. Brazil. B.M. 2748. B.R. 17:1433 (as *Eulophia Mackaiana*). P.M. 3:97. L.B.C. 17:1664. J.H. III. 33:295. —This is distinguished from *Z. intermedium* and *Z. crinitum* by its smooth labellum and narrower lvs. Vars. **supérbum, grandiflòrum, màjus** are also advertised.

3. **Gautièri**, Lem. Pseudobulbs oblong sulcate, 4 in. high: scape 2–3-fld.: fls. 3 in. across; sepals and petals green blotched with brown; labellum broadly reniform, deep purple at the base, white in front, sometimes nearly all deep purple with a darker crest. Autumn. Brazil. I.H. 14:535. Gn. 49:1053.—The lvs. are fasciculate, narrowly oblong, keeled, 12–16 in. long: inflorescence shorter than the lvs.

4. **maxillàre**, Lodd. Pseudobulbs 2 in. long: lvs. lanceolate, 1 ft. long: scape 9 in. long, 6–8 fld.: fls. 1½ in across; sepals and petals ovate-oblong, acute, green, with transverse brown blotches; labellum horizontal, purple, with a very large, glossy-purple, notched horseshoe-shaped crest, middle lobe roundish, waved, and obscurely lobed. Winter. Brazil. B.M. 3686. L.B.C. 18:1776. J.H. III. 33:295. P.M. 4:271.—Distinguished by its small fls. and very large crest.



2799. Zygopetalum Mackaii (× ¼).

5. **crinitum**, Lodd. Habit of *Z. intermedium:* lvs. broadly linear-lanceolate: fls. on long, stout scapes; sepals and petals 2 in. long, oblong-lanceolate, green with rather few brown blotches; labellum 2 in. across, spreading, wavy, scarcely emarginate, white with purple veins radiating from the thick crest, disc hairy. Fls. at various times. Brazil. L.B.C. 17:1637. B.M. 3402 (as *Z. Mackaii*, var. *crinitum*).—This has fewer brown blotches on the sepals and petals than *Z. intermedium*. There are varieties with pink, blue, or almost colorless veins on the labellum. Var. **cœrùleum**, Hort., has the vines deep vivid blue.